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UNIVERSITY OF ALBERTA

INDIGO DYED SHIBORI TEXTILES: A CONTEMPORARY INTERPRETATION

BY

© WENDI JEAN WEIR

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of MASTER OF ARTS.

IN

CLOTHING AND TEXTILES

DEPARTMENT OF HUMAN ECOLOGY

EDMONTON, ALBERTA
FALL 1994

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FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled INDIGO DYED SHIBORI TEXTILES: A CONTEMPORARY INTERPRETATION here submitted by WENDI JEAN WEIR in partial fulfillment of the requirements for the degree of MASTER OF ARTS in CLOTHING AND TEXTILES.

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ABSTRACT

The purpose of this research project was to investigate Japanese shibori textiles to determine production methods that have been used historically; to undertake an exploration using various shibori techniques; and to design and produce contemporary shibori textiles suitable for exhibition.

Primary and secondary sources were utilized. Data were gathered from ethnohistorical sources related to the development of shibori; to technical instructions and diagrams for preparing shibori; and to contemporary shibori textiles.

A preliminary exploration of some shibori techniques was undertaken in order for the designer to become familiar with both the limitations and possibilities of each technique chosen. With this knowledge and the parameters established by the designer, six textile designs were created. Preliminary gouache studies were completed to approximate the appearance of the final textiles. Running stitches combined with various ways of manipulating the fabric were the techniques used throughout the investigation.

The six designs completed were produced on 100% cotton fabric and dyed in a vat of synthetic indigo. The six designs, composed of three diptychs and three triptychs, were executed in formats suitable for exhibition.

This investigation determined that it is possible to use Japanese shibori textiles and techniques as a source of inspiration for the production of contemporary shibori textiles. Recommendations for further research include: a methodical investigation of the motifs traditionally used in Japanese shibori, a methodical comparison of indigo dye recipes and their dyeing potentials, and an exploration of shibori beyond traditional forms.

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CHAPTER I

Introduction

One goal of research in the fields of human ecology and home economics is to improve the quality of life for individuals and families. Although human ecology and home economics investigations examining the basic physical needs of the family have been conducted, little attention has been paid to the psychological or aesthetic needs of individuals and families (Muc, 1989). There is a need for investigations which ensure consideration of basic physical needs as well as consideration of aesthetic needs of individuals and families, leading to a more holistic focus.

An important means through which aesthetic needs are met is through living in aesthetically pleasing surroundings.

> Fundamentally, human beings, whether Eastern or Western, need belief, free play of imagination and intuition in their homes and work-places or they become starved. All the cog-wheels and electronic brains cannot assuage these human needs in the long run . . .. Basically this is not so much a revolution against science and the machine as a seeking of a means of counterbalance by employing man's first tools, his own hands, for the expression of his inner nature (Yanagi, 1972, pp. 90-91).

Use of well designed handcrafted textiles is one significant way of improving surroundings aesthetically in the everyday environment and textiles have been used for many centuries to serve this function.

In a letter to members of the Textile Museum of Washington, D.C., McCracken (1992) states that textiles "carry the vibrations of a culture." When textiles are analyzed, characteristics may be found that identify them as originating from a certain culture. By tracing certain aspects of textiles such as the techniques used, the motifs and colors, and the spatial arrangement, some of the influences that have inspired the designer may be examined. Through this examination, researchers have determined that designs have been obtained from a variety of sources, both past and present. The utilization of the artifacts of other cultures as a source of inspiration for creating contemporary textiles is not a new concept but it is relatively new in the fields of human ecology and home economics.

The design and embellishment of textiles dates back to early history. Because of the fragile nature of textiles, and their susceptibility to degradation due to environmental

factors such as exposure to sun, moisture and micro-organisms, the number of extant early textiles is limited. However, evidence of early textiles may be examined in secondary sources such as literature, paintings, and pottery.

Muc (1989) notes that the roots of inspiration for all designs are buried in other sources. Not only are the designs guided by the principles and elements of design, but they evolve as a result of the designer's perceptions and interpretations of these sources. The perceptions and interpretations of the designer's experience are in a constant state of flux; ever shifting and expanding as a result of experiences and memories. "Because the creative process is always marked by the personality, life experience, knowledge and ideas of the individual creator, the process is as varied as the people who enter into it" (MacLeod, 1990, p.114).

Purpose and Objectives

The purpose of this research project was to examine traditional Japanese shibori textiles and techniques and to investigate the feasibility of utilizing these as inspiration for the production of contemporary shibori textiles. Specifically, the objectives of this study were:

1. to examine the traditional shibori textiles of Japan to determine the production methods which have been used historically;
2. to explore various shibori techniques; and
3. to design and produce a collection of contemporary shibori textiles suitable for exhibition.

The term *shibori* is derived from the Japanese root verb *shiboru*, meaning "to wring" or "to squeeze," emphasizing the action performed on the cloth (Wada, Rice & Barton, 1983). *Shibori*, often used synonymously with the term "tie-dye," refers both to the completed fabric and to the techniques used to prepare the fabric for immersion in a dye bath. *Plangi*, a Malay-Indonesian word, and *bandhana*, an Indian word, both refer to tied and bound resist methods of patterning and dyeing fabric (Buhler, 1954; Larsen, 1976; Wada et al.). Although tying and binding fabric in preparation for dyeing are probably the earliest shibori methods used to add designs and patterns to textiles, they represent only two of the methods that are used to prepare fabric for dyeing (Wada et al.). Other preparation methods in which a shibori resist is employed include: stitching, wrapping, folding and clamping (Gluckman & Takeda, 1992; Wada et al.).

Shibori textiles are characterized by design images with softly blurred edges which result from the capillary action of the dye penetrating the fabric. These edges are a permanent record of the wicking of the dye along the fibers of the cloth. Both Buhler (1967) and Minnich (1963) posit that shibori, like weaving, may be a technique that simultaneously evolved in many parts of the world sometime in early history. Even though shibori, as a resist technique, is not unique to Japan, mastery and execution of the various styles and methods of forming the resists have been assimilated by Japanese artisans so that they have become uniquely and recognizably a part of the Japanese culture.

"In Japan, there is no division between fine and decorative arts, and craftsmanship is very highly valued" (Yang & Narasin, 1989, p.31). As a result, textiles are among the greatest treasures in Japan's centuries old tradition of handcrafts.

> Since ancient times, textiles have been revered in Japan. According to legend, when the angry sun goddess plunged the world into darkness by hiding in her cave, other divinities enticed her out with dance and blue and white textile banners (Katoh, 1990, p.82).

Yang & Narasin group the textile arts of Japan into three broad categories: dyed textiles, woven textiles, and textiles with needlework and applied decoration. They further categorize dyed textiles based on the technique used to produce the design: 1) *katazome*: stencil dyeing; 2) *tsutsugaki*: freehand paste-resist dyeing; 3) *bingata*: stencil dyeing from Okinawa; 4) *yuzen*: multicolored paste-resist dyeing; and 5) *shibori*: stitch and tie resist dyeing.

This investigation aims at creating a collection of contemporary textiles that are inspired by, but are not copies of, traditional Japanese shibori dyed textiles. Just as the Japanese are noted for adopting, assimilating and then creating textiles which are uniquely their own, so it is the goal of this designer to adapt and assimilate shibori techniques and dye methodologies in order to create a collection of contemporary shibori textiles.

Significance of the Study

Singh (1989) noted the paucity of research in human ecology and home economics focusing on the interpretation of Indian designs and techniques for use by contemporary designers. Similarly, there is a lack of investigations in human ecology and home economics which utilize Japanese textiles as textile design inspiration sources for creating a collection of contemporary shibori textiles. The present study will help to fill the gap in the literature.

Limitations of the Study

The secondary sources used for data collection were limited to materials written in English. Another limitation was created by the designer's personal interpretation of, and resulting inspiration by, the textiles under investigation. Inspiration rises out of the personal bank of knowledge and experience of each individual. Consequently, how that inspiration is conveyed is specific to each designer. The contemporary shibori textiles produced for this thesis are limited to the interpretations of this designer and represent only some of the infinite design possibilities.

CHAPTER II

Literature Review

The review of literature considered previous investigations which utilized historical or cross-cultural textiles as sources of design inspiration for the creation of contemporary textiles.

Literature Related to Historical or Cross-Cultural Textiles as Sources of Design Inspiration For the Creation of Contemporary Textiles

Researchers have previously used historical or cross-cultural textiles as a source of design inspiration for creating contemporary textiles. Investigations conducted in the 1960's marked the beginning of studies that focused on the textiles of particular cultures as sources of inspiration. Both Haden (1965) and Goethalis (1969) used cross-cultural textiles in their investigations. Haden's study of ancient Peruvian textiles began with an investigation of the historical, social and cultural background of the ancient Peruvian people, and followed with an inquiry into the designs, colors, motifs, symbols, and techniques that were used. Haden created five original designs adapted from Peruvian textiles which were suitable for use in apparel, rugs and draperies. Goethalis created a variety of wall hangings and fabrics, as well as a wall paper design. The sources of her inspiration were contemporary art and craft items of West Africa such as pottery, basketry, carvings, and fabric decorations. Goethalis used batik, tie-dyeing, screen printing, stitching, photographic silk-screen processes, printing and drawing techniques to produce her six wall hangings, ten fabrics, three screen decorations and one wall paper design.

The studies during the 1970's that utilized a variety of techniques for creating the contemporary textiles are those of Campbell (1972), Fu (1972), Merriam (1973), and Richer (1976). Campbell was inspired by the design motifs and textile production methods of the Ashanti tribe in Ghana. Based on her interpretation and translation of five traditional Ashanti motifs which were repeated individually or in combinations, she produced seventeen contemporary textiles. Each textile was produced using one of five methods: batik, tie-dye, weaving, block printing or screen printing. Fu completed six original textiles which were based on ancient Chinese symbolic textile motifs. She used the same design methods as Campbell, with the exception that she used textile painting instead of tie-dyeing. Merriam examined the designs of the Cuna Indians of the San Blas

Islands as the source of inspiration for her textile creations. "The study included an investigation of the social organization, technology and ideology of Cuna culture" (Singh, 1989, p.10). Through an historical review and an examination of museum art objects, Merriam produced contemporary textiles which were utilized for interior and apparel design. Richer was inspired by Chinese woven silk textiles of the Han Dynasty and began her study with an historical overview of the pre-Han and Han Dynasties. She then compiled a catalogue of silk patterns from the Han Dynasty and used adaptations of these designs in her own works.

Three designers who used the single process of weaving for producing contemporary textiles were Beckham (1973), Schroeder (1976), and Rhee (1977). In each case, structural design was an integral part of the process of creating the textile as opposed to applying a decorative design to an existing fabric. Beckham studied Coptic interlinking, an ancient technique which she used in the production of contemporary wall hangings. After mastering the variations of the technique through sample explorations, she designed and wove six three-dimensional wall hangings. Schroeder researched Pre-Columbian textiles of Peru and observed contemporary Peruvian weavers at work. Her original textiles were inspired by designs found on historic Peruvian textiles. Rhee was inspired by historic Chinese textiles. Her research focused on the design motifs and production techniques used in these textiles. Her interpretations of these symbolic motifs were used in the creation of her original weavings.

Three researchers during the 1980's used cross-cultural textiles as inspiration sources for producing collections of contemporary textiles: Baudoin (1984), Muc (1989) and Singh (1989). Baudoin used West African designs and techniques as the inspiration source for her contemporary textiles. Several techniques were investigated including tie-dyeing, batik, block printing, screen printing and stenciling, and weaving. Baudoin was particularly interested in the symbolic meaning of the African designs. Her thesis provides a detailed description of each design technique, the historical background of the technique, the motifs used, the materials and processes, and examples of her own interpretations. Muc investigated Sumatran textiles in terms of the cultural significance of the textiles, the motifs and patterns used, and both applied and structural production methods. Her collection of six contemporary textiles, for interior design use, integrated weaving and applied design methods such as silk screening and embroidery. Singh used Gujarati textiles of northwest India as the inspiration source for her original textiles. Her investigation of the history, motifs, and production techniques of Gujarati textiles led to

the production of six silk wall hangings executed using wax resist and direct painting techniques.

Although various cultures have been used as the focal point for textile design investigations, no formal research studies were found which documented the use of traditional Japanese textiles as a focal point of contemporary textile production. This does not mean that Japanese textiles have not influenced the production of contemporary textiles, but it does mean that their use has not been documented in the same methodical manner as in the literature reviewed.

CHAPTER III

Research Design and Methodology

Data Collection

This investigation utilized qualitative ethnohistorical research methods to obtain data from secondary sources written in English. The secondary sources included books, journals, exhibition and museum catalogues, and unpublished theses and dissertations. The data were collected in Canada using sources available at the University of Alberta and through interlibrary loan. The data gathered provided an overview of the historical development of textiles in Japan from the Asuka through Meiji periods, as well as an insight into the development of shibori. Since the purpose of the investigation was to use shibori techniques to create contemporary shibori textiles, particular attention was paid to materials and techniques that were traditionally used to produce shibori.

Ethnohistorical Aspects of Japanese Textiles

Japan is composed of a group of more than 3,900 islands of which four are main islands: Hokkaido, Honshu, Shikoku, and Kyushu. The natural boundaries common to island nations permitted the Japanese to repeatedly open themselves to, or close themselves off from, contact with the rest of the world. As a result, cross cultural influences have been spasmodic. The periods when there was no, or limited cultural contact, which are often referred to as periods of isolation, were periods during which the Japanese had an opportunity to assimilate the aspects of foreign culture that appealed to them and to make these aspects a unique part of their culture. Yamanobe (1966) refers to this assimilation as a process of first swallowing whatever it is that the Japanese have chosen to adopt, and then giving their hardy stomachs the leisure to digest it so that it can then become part of their own flesh and blood. This is not a process of replacement or substitution, but rather, it is a process of assimilation and elaboration of existing Japanese artifacts and traditions. In a similar sense, this project is an assimilation and elaboration of a design source.

As a part of material culture, textiles do not evolve in isolation, but undergo processes of assimilation and synthesis. An examination of some of the important social, political and economic factors of assimilation were reviewed for this investigation in order to determine how these might be reflected in the development of Japanese textiles. One

way to examine these factors is to examine them within the context of Japan's historical periods (see Table 1). Yamanobe (1966) describes three main periods during which Japan was subjected to strong influences from abroad. These periods of influence were separated by periods of isolation.

The first period of foreign influence, from the mid sixth century through to the eighth century, includes the Asuka and Nara periods. This initial period of foreign contact was followed by a period of isolation which included both the Heian and Kamakura periods. The second contact period occurred during Muromachi and Momoyama periods of the fifteenth and sixteenth centuries. Following this second period of contact, Japan isolated itself for just over 250 years during the Tokugawa (Edo) period. The Tokugawa period is considered to be the richest period of cultural development in Japan's history. Following the Tokugawa period, during the latter half of the nineteenth century and the early years of the Meiji period, Japan opened its doors to outside influences for a third time. This period was characterized by the introduction of new European and American technologies.

Historical Periods			
	Period Name	Years	Period Perspective
1.	Asuka	552 - 710	Contact
2.	Nara	710 - 794	Contact
3.	Heian (Fujiwara)	794 - 1185	Isolation
4.	Kamakura	1185 - 1333	Isolation
5.	Muromachi (Ashikaga)	1333 - 1568	Contact
6.	Momoyama	1568 - 1600	Contact
7.	Tokugawa (Edo)	1600 - 1868	Isolation
8.	Meiji	1868 - 1912	Contact

Table 1. Periods of Japanese cultural contact and isolation.

Asuka and Nara Periods: Periods of Cultural Contact

Liddell (1989) notes that during the Asuka period, in the fifth and sixth centuries A.D., Japan became a unified empire. The Asuka period brought trade between Japan and her neighbors, China and Korea, and with it came important influences on traditional

Japanese textiles (Liddell; Yang & Narasin, 1989). In 552 A.D., immigrants from China and Korea imported advanced weaving techniques such as kasuri and dyeing techniques such as batik with them to Japan (Buhler, 1967). The introduction of Buddhism from Korea in 552 A.D. was another influence on Japanese textiles (Buhler; Liddell; Yamanobe, 1966).

The Nara period, in the seventh and eighth centuries A.D., marked the beginning of an aristocratic era in Japan. Hall (1971) suggests that Japan's notions regarding authority, administrative organization, taxation and judicial process were established at this time. He also states that Nara "was the physical embodiment of the new power and wealth of the state and the symmetry of the administrative and social conceptions that were contained in the Taiho codes" (p.49).

The Taiho Codes were laws closely modeled on those of China (Hall, 1971; Reischauer & Craig, 1989), and established a hereditary hierarchical system of government which replaced the feudalism of previous ages. With the introduction of the Codes, the government declared that all rice producing lands belonged to the emperor. Systems were devised, using households as the base units, for allotment of land and for collection of taxes (Hall). Households receiving land paid taxes for use of the land. That the taxes could be paid in kind with silk and hemp textiles indicates the value placed on textiles during the Asuka period (Buhler, 1967; Hall).

Yamanobe (1966) states, "Japan from the earliest times entertained cultural relations with China, and via China, with the other countries of the Orient" (p. 207). The establishment of embassies in China facilitated official relations and provided opportunities for exchange. One theory regarding the introduction of shibori to Japan is that it was introduced from China. Minnich (1963) notes most of the fabrics housed in the Shoso-in repository at Nara are fragile fragments. In addition to *kokechi,* a term first used in the Nara period when referring to tie-dyeing, two other types of resist dyed textiles are found in the Shoso-in: *kyokechi* using folded fabric clamped between carved wooden blocks, and *rokechi* using melted wax as a batik method (Wada et al., 1983). Kyokechi, kokechi, and rokechi, are terms of Chinese derivation and provide linguistic evidence of the influences that Chinese textiles had on Japanese textiles. Kokechi is a term that was mentioned in records of China's T'ang dynasty when referring to shibori fabrics that were probably introduced to China from India via the missionary trade route (Minnich). The textile fragments found at the Shoso-in illustrate the high level of skill of Japan's crafts people, and the influences of Chinese, Indian, and Persian designers (Hall, 1971; Hauge & Hauge

1978). Yamanobe suggests that even if kokechi dyeing did exist in Japan before the eighth century, a well developed form was also introduced from China. He believes it was the introduction of the well developed form from China that influenced the Japanese to further develop their own skills.

The textiles housed in the Shoso-in also provide evidence of the types of fabrics that were used during the Nara period. For example, the common people wore textiles woven of bast fibers, referred to as *asa,* patterned with a small amount of shibori. When compared with clothing of the subsequent Heian aristocracy, it was clothing of the common people that most used dyeing techniques as a means for patterning their textiles (Hauge & Hauge, 1978; Yamanobe, 1966). In the Heian period, common people continued to use the simple technique of tie-dyeing as a means of patterning their own textiles.

Heian and Kamakura Periods: Periods of Isolation

In 894, Japanese diplomatic relationships with China were terminated, and, for the most part, direct cultural contact with China was limited during the Heian and Kamakura periods (Liddell, 1989, Wada et al., 1983). During these periods, choice woven silk fabrics for the aristocracy continued to be imported from China, as well as from Portugal, India, and the Near and Middle East. The court based aristocracy remained strong until the end of the Heian period and were instrumental in the refinement of many of the arts and crafts of the period (Buhler, 1967). Their preference for indigenous arts and crafts, along with the lack of outside cultural contact, meant that this was an assimilation period for Japan.

The beginning of the Heian period was also marked by a reaction on the part of the imperial family to the Buddhist monasteries which had become extremely powerful by the end of the Nara period (Hall, 1971). In an attempt to reduce or eliminate the effects of these monasteries, the imperial family abandoned the existing capital at Nara and a new capital was established safely out of reach at Heian, the site of present day Kyoto (Hall; Wada et al., 1983). "It was here in this city that a truly native Japanese style developed and flourished in all the arts" (Wada et al., p.15).

The Heian court nobles reached heights of achievement that were reflected in many of their textiles. Sophisticated dyeing methods were required to create the colors of the elaborate, many layered *juni-hitoe* worn by the ladies of the court. These voluminous

aristocratic robes were made mostly of damasks and brocades. The robes were unlined and dyed different colors. It was important to have the edges of each color properly displayed at the sleeve, neck and hem edges (Liddell, 1989; Wada et al., 1983). Because each layer was simple in color and design, the use of shibori as a means of creating patterns and designs did not undergo extensive development during the Heian period (Yamanobe, 1966; Minnich, 1963). Wada notes that there is evidence of the use of shibori fabrics at this time, as they are described in many literary sources, and depicted in paintings of the period. Although there are no extant examples of shibori textiles from either the Heian or Kamakura periods, the picture scrolls depicting the customs of both periods show shibori textiles (Noma, 1974; Yamanobe).

It was during the Heian period that shibori textiles became more widely used. Coarser techniques were used by the lower classes while the finer techniques were reserved for the higher classes (Wada et al., 1983). The first evidence of *kanoko* shibori appeared during the Heian period. Kanoko shibori is characterized by small circular spots which form on the fabric as a result of small pinches of fabric being tightly bound. The kanoko patterns are similar to the patterns of the kokechi examples that are found in the Shoso-in (Noma, 1974). However, in spite of its early development, Minnich (1963) notes that kanoko shibori did not become an important design feature until the Momoyama period several centuries later.

At the beginning of the Kamakura period, the samurai military government established headquarters at Kamakura (Hall, 1971; Wada et al., 1983). Samurai were the provincial warrior elite who developed a feudal system of government much like that of feudal Europe (Hall, Reischauer & Craig, 1989). The new feudal system of government was slow in taking power from the emperor, and throughout most of the Kamakura period, the samurai government coexisted in equilibrium with the emperor and his imperial court in Kyoto (Hall). Under the samurai developed feudal system, a shoen system of private land ownership was slowly created. Because these land owning proprietors were not subject to the Emperor's control, the power of the central aristocratic government was eventually reduced.

The new provincial form of government helped to raise the cultural and economic standards of the rural areas. Hall (1971) indicates that the shoen were encouraged to become centers of craft production, facilitating the slow development of shibori during the Kamakura period. Because shibori dyed silks were still used as currency for payment of taxes, the quality of goods being produced improved (Buhler, 1967; Wada et al., 1983).

Establishment of the samurai government had a significant effect on clothing and textile design styles. In keeping with their rural background, the new governments encouraged austerity and frugality. Frugality was also closely allied with the Buddhist philosophy of simplicity (Hall, 1971; Wada et al., 1983), and an underlying belief that luxury led to weakness (Hall). Because of their view of the importance of frugality, the samurai members of the military governments adopted the simple yet practical clothing of the common people.

As the aristocracy's power was gradually diminished, the highly elaborate dress that was associated with them was also abandoned. Clothing restrictions imposed by the new samurai government reduced the extravagance of court attire by mandating simpler fashions, which emphasized the beliefs in frugality and austerity (Liddell, 1989; Yang & Narasin, 1989). As a result, the court ladies abandoned the juni-hitoe and began to wear the simpler *kosode*, which was the undergarment to the many-layered robes, basic outer garment of the commoners, and precursor of the kimono (Wada et al., 1983; Yang & Narasin). Yang & Narasin and Wada et al. agree that although the first kosode were unadorned, they gradually became quite elaborately decorated by use of techniques such as shibori. Liddell notes that lower ranking samurai women, in their attempts to imitate the elaborately woven patterns of the silk fabrics used only by the higher ranking samurai, began to use shibori as an inexpensive method for patterning their garments. Wada et al. notes that during the Kamakura period, refined stitching techniques were utilized for producing shibori textiles. These stitching techniques were further developed for use in the tsujigahana textiles of the Momoyama period.

Muromachi and Momoyama Periods: Periods of Cultural Contact

During the Muromachi and Momoyama periods, there was both a development of the Japanese arts, as well as "a strong infatuation with foreign and exotic things" (Noma, 1974, p.84). Goods such as "woven brocades, damasks, velvets, embroideries and fine silks " (Liddell, 1989, p.80) were imported from China, and with the arrival of Portuguese ships, wool, velvet, and printed cottons from India arrived in Japan (Liddell). The Muromachi period was a period of civil wars and great political turbulence and once again the capital was returned to Kyoto. Wada et al. (1983) indicates that the Muromachi period was also a period of economic, cultural, and artistic development. The rulers of the Muromachi period were refined in their preferences and were noted as being patrons of the arts (Yang & Narasin, 1989).

Evidence of economic development and expanded economic production first became apparent in agriculture. The regional military leaders encouraged technological improvements which permitted expanded commercial farming and handcraft production. Goods which had previously been produced only for local consumption were now introduced into an emerging commercial market, and items such as raw silk, linen and dyestuffs were produced for general market sale (Hall, 1971). Specialization of function produced new groups of craftspersons who, as they became detached from positions in the shoen, formed guilds known as *za*. The newly formed za tended to form around the prestigious centers of Kyoto, Kamakura and Nara. Craftspersons claimed monopoly rights which, along with protection, were guaranteed by a patron.

The Onin war, which began in 1467, marked the beginning of the fully decentralized phase of Japanese feudalism (Reischauer & Craig, 1989) and a period of civil wars which lasted for a century. The wars stimulated economic activity, and a class of rich and influential merchants developed as a result of trade with China (Wada et al., 1983). A new kind of local authority in the form of the *daimyo*, or local lords, took over and the shoen disappeared (Reischauer & Craig).

"It was during this time that dyers developed an ingenious way of using stitching as a shibori technique to create designs of stylized natural motifs. By the end of the sixteenth century this dye-patterned cloth was worn by people of all classes and by men and women alike" (Wada et al., 1983, p.20). The leaders of the Momoyama period wore elaborate clothing which was richly decorated using gold thread embroidery and appliquéd gold leaf (Liddell, 1989). During this period, people spent a great deal of energy trying to outdo each other with elaborately decorated clothing and even the clothing of commoners grew more luxurious (Noma, 1974). Noma indicates that as a result of discarding many art traditions during the Momoyama period, artisans were more spontaneous and creative in their textile design explorations.

The Momoyama period was short in duration and fell between the turbulence of the Muromachi period and the peace of the Tokugawa period which followed. Wada et al.(1983) mentions that the most creative shibori producers at this time were supplying wealthy patrons with fine silks. Wada et al. states, "Shibori dyeing continued to develop during the last years of the Muromachi period, but it was during the brief, joyful, extravagant period of Momoyama that followed that it attained its peak of perfection" (p. 22). The wealthy were not the only class wearing shibori fabrics. Shortly after 1573, military leaders also began to wear outer garments that were patterned with shibori, and

increased demand by the commoners for shibori fabrics led to the development of quickly and easily produced standardized patterns using inferior quality silk (Minnich, 1963).

By 1600, the art of *tsujighana*, which is a combination of hand painting and stitched shibori, had reached its peak. Prior to the development of stitched shibori, binding had been the primary shibori production method used. The tsujigahana fabrics were sometimes further embellished with embroidery and stenciled silver or gold leaf. Ito (1985) and Wada et al. (1983) agree that it is impossible to determine when this type of shibori first developed. Tsujigahana became popular in the mid-sixteenth century during the Muromachi period and by the second decade of the seventeenth century, during the Momoyama period, its use was terminated (Gluckman & Takeda, 1992; Ito; Noma, 1974). Because the sumptuary laws did not permit the common people to wear silks, tsujigahana was often used on cotton as well (Minnich, 1963). However, most of the extant examples are silk garments that belonged to the ruler, Tokugawa Ieyasu.

During the last three decades of the sixteenth century, Japan was unified under a central authority. In 1598, the new ruler, Tokugawa Ieyasu, established his power by first moving the capital to Edo, the present site of Tokyo. He also confiscated the lands of those daimyo who had opposed him. Some of the land went to his own Tokugawa family and the remainder was parceled out to his followers. Ieyasu was made shogun in 1603, marking the beginning of the Tokugawa shogunate, a period of over 250 years of peace (Hall, 1971).

Tokugawa Period: Period of Isolation

The Tokugawa Shogunate was a period of undisturbed peace which lasted from 1602 to 1868. "The leaders of the Tokugawa shogunate made every effort to stratify society and to perfect the feudal system as quickly as possible" (Noma, 1974, p.37). The merchant class, one of the four hierarchical stratifications of the Tokugawa period (samurai warriors, farmers, merchants and artisans), was noted for its cultural rise. Clothing restrictions were determined according to class and individuals were punished if they were found wearing unsuitable clothing (Noma).

The Tokugawa period marked the richest period of development in the history of Japan and many of the habits and customs that are viewed as being characteristically Japanese were refined during this period (Buhler, 1967). The feudal lords, in various parts of the country, gave protection and encouragement to the producers in their districts as

part of their economic policies. This factor encouraged higher levels of craftsmanship in textile items that were produced during this time (Yamanobe, 1966). The prosperity of the military government, which was joined by a moneyed middle class, was reflected in the production of lavish textiles and in the development of new textile design techniques (Buhler; Vollmer & Gilfoy, 1981). A demand for increasingly advanced and sophisticated production techniques developed as specialists produced textiles intended for local market sale.

Dyeing innovations in the Tokugawa period produced new possibilities with respect to design, pattern, and technique (Yamanobe, 1966). During the latter half of the seventeenth century, *yuzen* dyeing was developed as a means to circumvent the sumptuary laws imposed by the government (Vollmer & Gilfoy, 1981). The sumptuary laws were the government's repeated attempts to curb the extravagance of the newly rich (Noma, 1974). Some of the more costly shibori techniques, such as the allover *kanoko* shibori, were banned (Vollmer & Gilfoy). However, even though the commoners were forbidden to wear certain types of garments in public, they circumvented the laws by wearing the forbidden fabrics in the privacy of their homes (Buhler, 1967).

According to Yamanobe (1966), yuzen was "the most important dyeing technique of the early modern age" (p. 211) and is a technique that is still used today. Mastery of the technique permitted the creation of exquisitely colorful designs. Interestingly, it was as a result of the development of yuzen dyeing that shibori artisans advanced and refined the inherent characteristics of shibori resulting in the development of many new shibori techniques (Yamanobe).

A leaflet printed by the Aichi Shibori Industrial Corporation notes that in 1610, a feudal lord from Kyushu, where shibori had been known, traveled to Nagoya to build Nagoya Castle. Skilled shibori artists who traveled from Kyushu to Nagoya taught the technique to the people of Nagoya, who handed the skills down through successive generations. The shibori merchants in the Nagoya area became successful by selling their products to travelers passing through Narumi and Arimatsu on the Tokaido highway. Steady traffic on the Tokaido highway, generated in part by a requirement for the feudal lords to regularly travel to Edo, led to an increased demand for shibori textiles with greater variety, and new and innovative patterns. The responses to this demand led to increased sales and the "introduction of a division of labor in the production of shibori" (Wada et al., 1983, p.24). The bound shibori, which had been widely used by the common

people, was the first shibori method used to produce patterns at Arimatsu (Wada et al.). Arimatsu and Narumi remain centers for shibori production to the present.

Meiji Period: Period of Contact

"In 1868 the Japanese aspired to a reassertion of national prestige under imperial authority" (Hall, 1971, p. 48). The shogun resigned and once again Japan was ruled by an emperor of the imperial court, now located in Edo, renamed Tokyo (Wada et al., 1983). The Meiji Restoration of 1868 marked the end of the long feudal period and the beginning of the modern age of Japan. With the Meiji period came "political and social reforms, foreign trade and contact with the West" (Buhler, 1967, p. 6). The first part of this period was marked by a frantic effort to borrow from outside cultures particularly Europe and the United States. Individuals were sent from Japan to learn and return with new technologies. Technology in the form of power looms and chemical dyes was particularly relevant to the textile industry since, as Buhler indicates, industrialization led to the deterioration of weaver's and dyer's standards. As the demand for western goods increased, many Japanese textile traditions began to decrease in importance.

With the transfer of power from the shogunate to the emperor, there was no longer heavy and regular traffic on the Tokaido highway, as had been the case during the Tokugawa period. Consequently, Arimatsu lost much of its shibori market. This forced the creation of new and faster methods for preparing the shibori patterned fabric so that Arimatsu shibori could compete with shibori textiles produced in other centers. One example of a faster method was the development of *arashi* or pole wrapping shibori. In this method, a light weight fabric is wrapped, bound, and compressed around a pole. *Ita-jime*, or board clamping shibori, is another example of a faster technique that also developed at this time. In this case, the fabric is folded and sandwiched between two mirror image boards that are tightly bound together before immersion into a dye vat. Wada et al. (1983) indicates that traditional time-consuming stitching techniques were still used by individuals in their homes in the production of shibori textiles as late as the early 1900s.

Shibori Textiles as Sources of Inspiration

An integral part of an investigation that had as its outcome the production of a collection of textiles was a review of visual as well as textual sources. Because the aim of this investigation was to create contemporary shibori textiles inspired by historical textiles from Japan, it was relevant to view many examples of traditional and contemporary shibori. Viewing traditional shibori provided me with knowledge and an appreciation of historical designs, and viewing contemporary shibori provided a context within which I designed this collection. This visual review included primary sources such as shibori exhibitions, and secondary sources such as Shibori: The Inventive Art of Japanese Shaped Resist Dyeing (1983) by Yoshiko Wada, Mary Kellogg Rice and Jane Barton.

In 1992, an International Shibori Symposium was held in Nagoya, Japan, which provided me with an opportunity to view several exhibitions of both traditional and contemporary shibori. The Nagoya Citizen's Gallery hosted two exhibitions: "Tradition and Creativity," an exhibition based on traditional shibori techniques used in a contemporary context, and "Exotic Kimono--Works by Foreign Artists." The latter exhibition consisted of contemporary textile works, including shibori examples, by international artists who had not previously used the kimono format. The Nagoya Municipal Museum hosted two exhibitions, "Masterpieces of World Shibori," which focused on traditionally designed shibori textiles, and "The Future of Shibori Textiles" an exhibition of contemporary shibori examples. Another relevant exhibition was "Creative Shibori Works From Selected Colleges and Universities." This exhibition contained shibori works that had fresh and innovative perspectives.

Sueo Taki (1992), in the foreword to the exhibition catalogue of shibori textiles exhibited during the Shibori Symposium, comments that shibori "is flourishing internationally in the textile industry as well as in the craft and art worlds" (p.2). The review of the visual sources showed there are a number of artists and designers, both Japanese and North American, using shibori as a basis for creating textiles. Some of the most notable Japanese designers using shibori are Jun'ichi Arai, Kaei Hayakawa, Yoshiko Inaba, Hiroshi Ujii, Itchiku Kubota and Hiroyuki Shindo. In North America, some of the noted artists using shibori are Analisa Hedstrom, D'Arcie Beytebiere, Junco Sato Pollack, Marian Clayden, and Barbara Goldberg.

In Japan, Jun'ichi Arai combines shibori techniques with non-traditional materials. Using newly engineered synthetic fabrics, he chemically dissolves a portion of the unresisted areas to create pattern. Kaei Hayakawa uses arashi shibori and wonders "how we can apply traditional technique to new art?" He also asks "how can we encompass our individual perspective in our art?" (International Shibori Symposium Program, 1992). Yoshiko Inaba utilizes shibori in a non-traditional conceptual format with indigo to explore the sculptural possibilities of shibori, and Hiroshi Ujii has selected the traditional kimono as the format for his explorations. He uses a combination of techniques which appear to have been inspired by the tsujigahana textiles of the Momoyama period. Also inspired by the rich beauty of the tsujigahana textiles is the work by Itchiku Kubota. Kubota has spent many years researching and experimenting with the stitching, dyeing, and painting techniques he uses to achieve his lush, luminescent textiles. Kubota states that he seeks to "establish his own style rather than reproduce the classic objects he reveres" (Wada et al., 1983, p.260). Hiroyuki Shindo is one of the few remaining natural indigo dyers in Japan. He uses only natural indigo in conjunction with natural fabrics for his installations, which are simple, conceptual interpretations of shibori.

In North America, the work of Analisa Hedstrom has been inspired by the atmospheric and textural properties of traditional arashi shibori. Hedstrom combines arashi with western pleating, creasing, and smocking techniques, and often uses a smocking machine in conjunction with hand stitching. Regarding her work, Hedstrom (1993) comments she is interested in "rhythm, scale, harmony, dissonance, [and] mood, [and] I like to challenge myself and to stretch the apparent limits of technique" (p.42-43). D'Arcie Beytebiere uses arashi shibori techniques in conjunction with rich colors and beading to explore her interest in the textural possibilities of shibori. She often leaves the shibori process threads in her textiles, incorporating them into the finished work. "This leaving of the process threads in my work has become a signature of my pieces" (Beytebiere, 1993, p.66). The work of Junco Sato Pollack takes the form of sculptural adaptations shaped as vessels. She prefers to use silk with fine gold or silver filaments running through it. The tightly bound resists are left in the fabric to achieve her sculptural works. Pollack (1993) comments "skills take time to ferment and mature. There are things that simply cannot be produced in large numbers" (p. 91). Marian Clayden is "drawn to the techniques of resist dyeing, binding and clamping, along with the idea of using discharge to create designs" (as cited in the International Shibori Symposium Program, 1992). Her work is characterized by the use of board clamping techniques in conjunction with brilliant colors. Wada et al. (1983) notes that Barbara Goldberg was first

introduced to shibori techniques in the 1970's. Goldberg has explored both board clamping and arashi techniques and has used indigo extensively in much of her work.

Methodology

The synthesis of the knowledge of the ethnohistorical development of shibori textiles and the inspiration gained through viewing examples of both traditional and contemporary shibori textiles began with the selection of dye, fabric and specific shibori techniques. The methods that were used for the creation of the contemporary shibori textiles are discussed under the following headings: 1) dye selection, 2) fabric selection and preparation, 3) preliminary technical exploration, 4) design production, and 5) production of contemporary indigo dyed shibori textiles.

Dye Selection

Indigo is one of the oldest natural dyes. Buhler (1967) posits that it is possible that the use of indigo as a dye evolved independently in many different areas of the world. According to Liles (1990), the oldest dated example of an indigo dyed textile, is from ca. 3500 BC. and was found in Thebes. Indigo, or *ai* as it in known in Japan, is derived from the leaves of various species of the *indigofera tinctoria* family of plants (Geijer, 1979; Vetterli, 1951). Indigo used in Japan is derived from *polygonum tinctorium* (Wada et al., 1983), which was also cultivated in China and Manchuria (Vetterli).

Indigo was one of the most important natural dyes used for dyeing ancient Japanese textiles (Wada et al., 1983). It was introduced to Japan, via south China, in the eighth century and was widely used, particularly by the common people (Wada et al.). Liddell (1989) notes that indigo was also thought to relieve fevers and stomach ailments and functioned as a pesticide. Buhler (1967) indicates that during the Tokugawa period "indigo grew so popular that there was at least one indigo dyer in every village and town in Japan" (p.6).

Indigo falls within a class of dyes known as vat dyes. "Vat dyes are insoluble in water and have no affinity for fibers until they are converted to a product that is soluble in an alkaline solution" (Joseph, 1986, p.328). During the conversion process, a reduction reaction, the indigo is converted to a soluble solution that can be absorbed by the fibers of the cloth. When the fabric is removed from the vat, an oxidation process occurs and returns the indigo absorbed by the fibers to its original insoluble state (Adrosko, 1971). Geijer (1979) notes that indigo is one of the most durable natural dyes. Indigo produces a

wide range of blues from the palest of blues to a deep blue-black. Except for the palest shades, vatted indigo is quite lightfast, resistant to acids and alkalis, washfast, resistant to perspiration, and rubfast when properly dyed and scoured (Liles, 1990).

In 1880, synthetic indigo, which has the same chemical structure as that of natural indigo, was developed by Adolph von Bayer, a German chemist (Liles, 1990; Sandberg, 1989). By 1897, the first synthetic indigo was introduced to the German market, and by the 1920's, the use of natural indigo had declined extensively in many areas (Liles). There are several advantages to using synthetic indigo: it is more readily available, it contains fewer impurities, the color is constant (Sandberg), and it is less expensive than natural indigo. In keeping with the shibori tradition, indigo was the dye selected for this investigation. Because of availability, synthetic indigo was used for the contemporary shibori textiles produced for this project.

Fabric Selection and Preparation

Bast, silk and cotton are all fibers that have been used historically in Japan, where the earliest textile materials used for producing indigo dyed shibori textiles were made from bark and stalk bast fibers. Bast textile fibers are made from fibers that surround the core of various plant stalks. Bast fibers, such as hemp, ramie, jute and linen, which were all referred to as *asa,* were used to weave textiles which were worn by all classes, but they were the only textiles the common people were permitted to wear (Buhler, 1967). Wada et al. (1983) indicates that it is not certain when silk was first used in Japan, but by the third and fourth centuries it was being woven into textiles for priests and for members of the wealthy ruling classes. The use of silk fiber textiles was restricted to the upper classes. By the fourteenth century, cotton fabric was imported into Japan via China and Korea, but cotton production in Japan did not begin until early in the fifteenth century, during the Muromachi period (Buhler; Wada et al.). It was not until the mid Tokugawa period that cotton became widely available (Hauge & Hauge, 1978). Cotton was used particularly for the clothing of the common people, and consequently, with the increased production of cotton, the use of *asa* decreased. Not only are cotton fibers softer and more flexible than bast fibers, they produce more durable textiles. Cotton is especially compatible with indigo and is capable of being dyed to exceptionally deep shades of blue.

In keeping with shibori tradition, a number of cotton and silk fabrics were subjectively chosen by this designer for this investigation. Although Joseph (1986) states "vat dyes are used primarily on cellulosic fibers such as cotton and rayon" (p. 329), indigo

is well suited for dyeing both cotton and silk fabrics. The selected fabrics were scoured using warm water and Synthrapol, a mild non-ionic detergent, prior to use. Scouring removed resins, sizing, or soiling that might hinder the uptake of dye within the fiber. The fabric was rinsed, hung to dry and where necessary, ironed to remove wrinkles. The fabrics were then ready for use.

Preliminary Technical Exploration

Once the fabrics were prepared, preliminary explorations of selected shibori techniques were undertaken. The techniques were selected subjectively by this designer. Each combination of fabric and technique had unique interaction characteristics and behaviors to which the designer became sensitive. The designer gained skill in executing various techniques, and awareness of both the limitations and capabilities of each technique through these explorations. When the designer was adept at using the techniques, it became possible to determine which techniques and fabrics could best be used to achieve desired effects. The action of tightly drawing up the prepared shibori fabric limited the combinations of techniques that could be placed in close proximity. A complete understanding of these limitations was achieved through the preliminary technical explorations.

The initial explorations were undertaken using samples of selected silk and cotton fabrics. These fabric samples ranged in size from 35 centimeters square to 90 by 250 centimeters. An synthetic indigo vat was prepared and used for dyeing. A journal was kept noting the type of fabric and the exact procedure followed in the production of each sample. Thoughts, limitations and possibilities were also recorded so that information would be readily available when the researcher wished to repeat a particular technique. When a level of confidence and skill in handling various shibori techniques had been accomplished, and an understanding of some of the limitations of the combinations of various techniques had been achieved, the design of the large shibori pieces began.

Design Production

Several factors contributed to the objective and subjective choices that were made during the production of the designs. Knowledge gained by the designer during the preliminary technical exploration expanded the designer's technical ability. The personal aesthetics, education, and experience of the designer, also had an impact on the choices

that were made. These choices formed the parameters within which the creative design process evolved.

Once the initial parameters were established, the next phase of the creative design process leading to the finished shibori textiles, described in Chapter 4, began. This process occurred at both conscious and subconscious levels and was an evolution which involved cycles of choices, evaluations, and reevaluations. With each evaluation, new choices were made and once again evaluated until such time as the design "felt" complete. These were intuitive subjective decisions based on the cumulative knowledge, experience and aesthetic sensibilities of the designer at that particular moment, but they were also objective decisions guided by the principles and elements of design. The process was not linear and often the designer had to discard a choice and return to an earlier phase of the process. This is a methodology which is congruent with the creative design process described by such writers as Zeisel and Wallas.

Zeisel (1984), in Inquiry by Design, states that the design process is "difficult to describe because it includes so many intangible objects such as intuition, imagination and creativity--which are essential to research as well" (p.3). He describes five characteristics of the design process: 1) use of three elementary activities consisting of imaging, presenting, and testing, 2) using two types of information, 3) shifting visions of the final product, 4) moving toward an acceptable final response, and 5) developing the design through the linking of cycles, which he describes with a spiral metaphor. Zeisel compares the imaging, which provides the general framework from within which to work, to scientific working hypotheses and states "just as hypotheses are refined during scientific exploration, images are developed during design activity" (p.7). Imaging, presenting and testing activities are part of an ongoing cyclical process which allows the design to be simultaneously developed and refined, thereby moving it closer to resolution within the range of acceptability.

Wallas' classic 1926 four-stage theory of creativity includes: preparation, incubation, illumination, and verification. If the stages are viewed as often repeated and overlapping cycles which lead to an end product, using a stage theory can assist in understanding the creative design process. Within the overall framework of the creative design process, choices were made both objectively and subjectively. In applying Wallas' theory to the designer's experience, stages one and four are approached more objectively, and stages two and three are approached more subjectively and intuitively guided by the knowledge and experience of the designer.

There were several stages which facilitated the design process in the current investigation:

1. production of preliminary sketches;
2. photocopying textile samples produced in the preliminary technical exploration;
3. drawing and photocopying the motifs that might be used;
4. manipulation of the scale of the photocopies by both reducing and enlarging the original copies;
5. production of exploration drawings and collages;
6. completion of samples which highlighted certain areas of the design;
7. production of scale drawings known as croquis of the final designs;
8. completion of approximate color studies using gouache on watercolor paper. Because of the inherent properties of textiles dyed with indigo, this phase was only an estimation of the value of the shade of the indigo used on the final textiles.

By photocopying and manipulating the scale of the chosen motifs, the designer was able to arrange the motifs on paper until a visually pleasing design was achieved. Using photocopies was a quick and effective means of achieving a visual approximation of the final designs because the size and placement could be changed easily. During this phase it was important for the designer to continue to be aware of the limitations and possibilities that each technique provided. As choices were made, the designer constantly stepped back and evaluated the effects of those choices. Many collages and drawings resulted from this stage of the design process and lead to the evolution of the final designs. Where necessary, the designer returned to samples in order to solve technical problems which arose from combinations of motifs and techniques.

For each finalized design, a small croquis was completed. The croquis was placed on a light table with the water color paper placed over top making the design visible enough to be traced onto the paper. Once the design was traced onto paper, gouache was used to approximate the anticipated color of the completed fabric. (See Appendix A). Because of the inherent properties of dyeing with indigo, it was impossible for the designer to anticipate all of the subtleties that would occur during the dyeing process. Therefore, the gouache studies were only approximations of the final pieces.

Production of the Indigo Dyed Shibori Collection

When the final designs had been determined, each design was drawn in full scale onto paper. The full scale paper patterns were placed on a large padded table and the prepared fabric was secured accurately with pins over the paper, ensuring that the grain lines of the fabric were straight. The final design was traced onto the fabric using *aobana*, a fugitive blue dye that is extracted from the spiderwort plant (Yang & Narasin, 1989), and a fine watercolor brush, size 00. The aobana was easily washed out of the fabric with water before the resisted fabric was immersed in the dye vat.

After the design was completely traced onto the fabric, selected shibori techniques were used to develop the stitched designs on the fabric prior to immersion in the indigo vat. 100% mercerized crochet cotton was used for all stitching and binding. Strong thread that could be tightly drawn up without breaking resulted in a clear, high contrast image.

Next, an indigo vat was prepared using synthetic indigo (see Appendix B) and the prepared fabrics were immersed in the vat for an average of three to four minutes. The fabrics were gently wrung out under the surface of the vat to remove as much of the dye liquid as possible, and then carefully removed and the remainder of the dye wrung out into an extra container. To facilitate the oxidation process after each immersion, the fabrics were either hung on a line, where the folds of the fabric were manipulated to expose them to air, or agitated in a large tub of cool water in which "the item will oxidize from the oxygen in the air" (Liles, 1990, p.66). The oxidation process usually required a minimum of ten minutes. As usual with indigo dyeing, the fabric needed successive dips in order to achieve the desired depth of shade. When the desired depth of color was achieved, the dyed fabric was rinsed in cold water until the water ran clear, which ensured that excess dye was removed. The fabric was then immersed in cold water and vinegar (1-2 ounces of vinegar per gallon of water) for approximately twenty-four hours. This process minimized the chance that any unwanted dye remained in the cloth. Excess water was squeezed out of the fabric and the tightly resisted fabric was hung to dry for two to three days.

Depending on the intricacy of design and techniques chosen, the removal of stitching was a time consuming process. Care was taken in removing the stitching and binding because a cut or tear at this stage could ruin the fabric. On completion of this stage, the opened fabric was again soaked in a solution of water and vinegar (1-2 ounces of vinegar per gallon of water) to neutralize any remaining dye solution (Liles, 1990).

Excess indigo dye that remains on the fabric will result in a yellowing of the fabric over time. After soaking the fabric, it was washed in warm water with Synthrapol, rinsed, hung to dry, and ironed.

CHAPTER IV

Discussion

Mooney (1975) refers to research as "an inner and outer drama" (p.175) with the inner drama referring to the intimate experience with self during the process. The creative design process is also an intimate experience. Therefore, because of the subjective and personal choices that are made during the creative design process, this chapter will be written in the first person.

Shibori is one of many Japanese textile traditions which contemporary Japanese designers and craftspersons continue to incorporate into their work. As a Euro-Canadian textile designer working within this tradition, it was my intent to use shibori techniques and to be inspired by the rich beauty of Japanese shibori textiles in order to design and produce contemporary shibori textiles suitable for exhibition.

When designing the collection of textiles, I tried to maintain a sense of unity within and among the textiles so that they could be exhibited as a unified group. A sense of unity can be achieved in a number of ways. For example, my objective and subjective decisions formed the parameters within which the contemporary textiles evolved. The parameters which provided the unifying guidelines for the collection will be discussed under the following headings: 1) techniques, 2) theme, 3) dye and fabric selection, and 4) format. This is followed by a discussion of the six large indigo dyed shibori textiles which I produced.

Techniques

During my preliminary exploration, I explored many shibori techniques; however, I was intrigued by the patterns and textural effects that could be created by employing only shibori techniques that utilized the running stitch. Wada et al. (1983) notes that the running stitch is the predominant stitch used in Japanese shibori. The manner in which the fabric is folded and manipulated before it is stitched results in unique effects. All the final textiles produced during this investigation utilize the running stitch as the means of preparing the fabric prior to immersion in the dye vat. It was a challenge to create a collection of textiles that could simultaneously maintain the viewer's interest and at the same time use only one stitching technique.

Mokume shibori, which is created when a number of parallel rows of running stitches are made in a single layer of unfolded cloth, was explored (see Figure 1). When the complete area has been stitched, the threads are drawn up tightly and secured with a knot (see Figure 2). If the stitches in every row are aligned, a pattern of parallel stripes is created. If the stitches are not aligned, but staggered irregularly, a 'wood grain' effect is the result (see Figure 3). It is the wood grain variation that I used in the production of this collection of textiles.

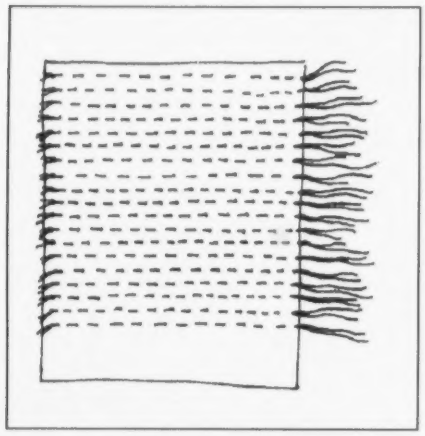

Figure 2. Mokume shibori

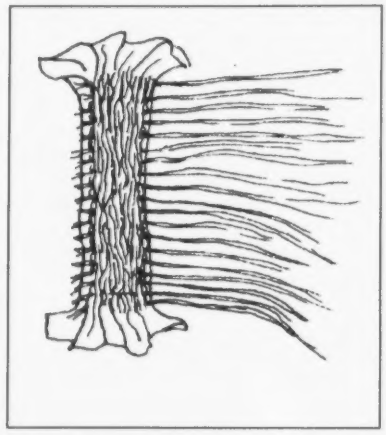

Figure 1. Mokume shibori

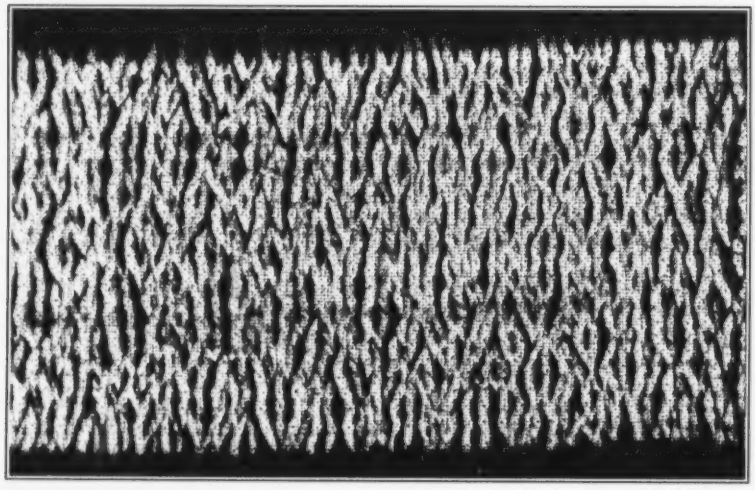

Figure 3. Mokume shibori.

Ori-nui (single fold) shibori, which is created when the fabric is folded on a single fold and a line of running stitches is stitched parallel and close to the fold line, was also

explored (see Figure 4). When the stitching was completed, the thread was tightly drawn up and knotted (see Figure 5). The resulting pattern consists of a fine dark central line at the edge where the fabric was folded. Staggered on either side of this centre line are the small fuzzy-edged shapes that characterize shibori (see center of Figure 8). Each of these resisted shapes, on either side of the line, is separated by a fine dark line that was created as a result of the folds that formed when the fabric was tightly drawn up.

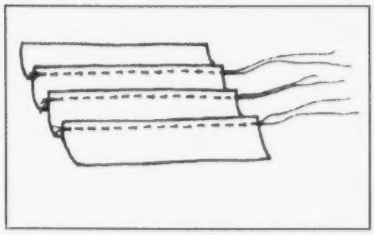

Figure 4. Ori-nui shibori.

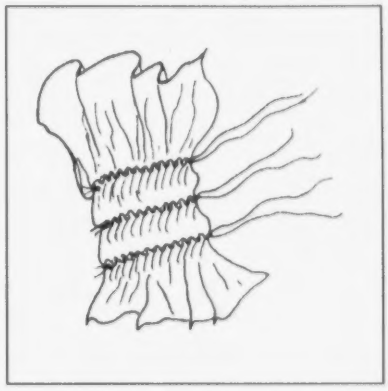

Figure 5. Ori-nui shibori.

Awase ori-nui (double fold) shibori, a variation of *ori-nui* shibori, was another technique that I investigated. In this variation, the fabric is folded on two parallel lines and brought together so that the folded edges match. A row of running stitches, parallel and close to the folded edges, is stitched through four layers of fabric (see Figure 6). The threads are drawn up tightly and knotted (see Figure 7). After the fabric has been dyed and the stitching is removed, a distinctive pattern results (see left of Figure 8). Two fine parallel lines form the border of an inside white stripe. Outside of each line, the white shapes form a regular staggered pattern with dark lines separating each shape.

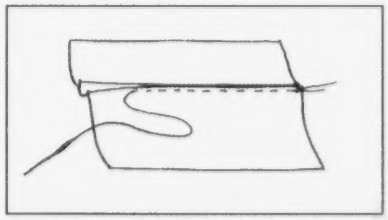

Figure 6. Awase ori-nui shibori.

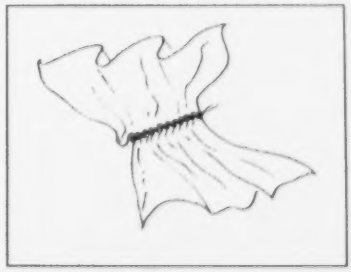

Figure 7. Awase ori-nui shibori.

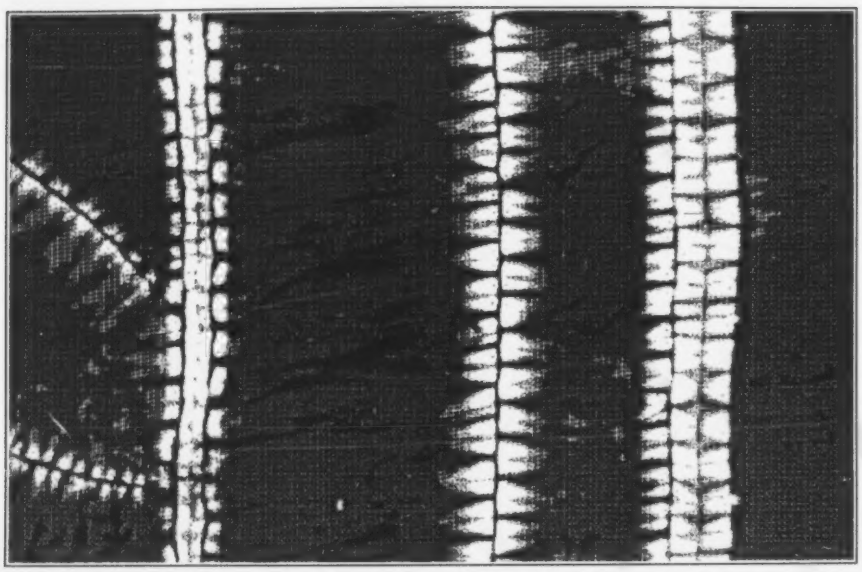

Figure 8. Awase ori-nui shibori, ori-nui shibori, and variation.

Awase ori-nui can also be used to create petal-like shapes of interlocking circle motifs (see Figure 9). Both sides of the arcs that create the petal shape are folded and brought together matching the two folded edges together before stitching through four layers of fabric (see Figure 10). Although Wada et al. (1983) suggests that these petal shapes should be stitched in a continuous row with one length of doubled thread, it became more manageable for this project to stitch, draw up and knot each petal shape separately (see Figure 11). The effect created can be seen in Figure 12.

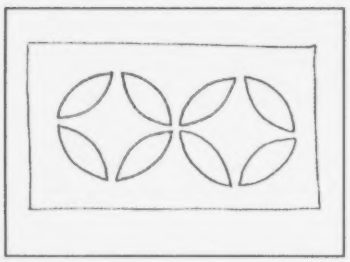

Figure 9.
Awase ori-nui, interlocking circles.

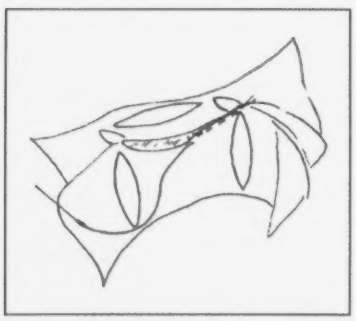

Figure 10.
Awase ori-nui, interlocking circles.

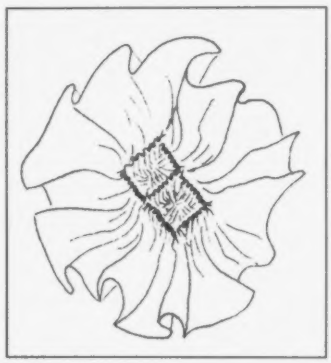

Figure 11.
Awase ori-nui, interlocking circles.

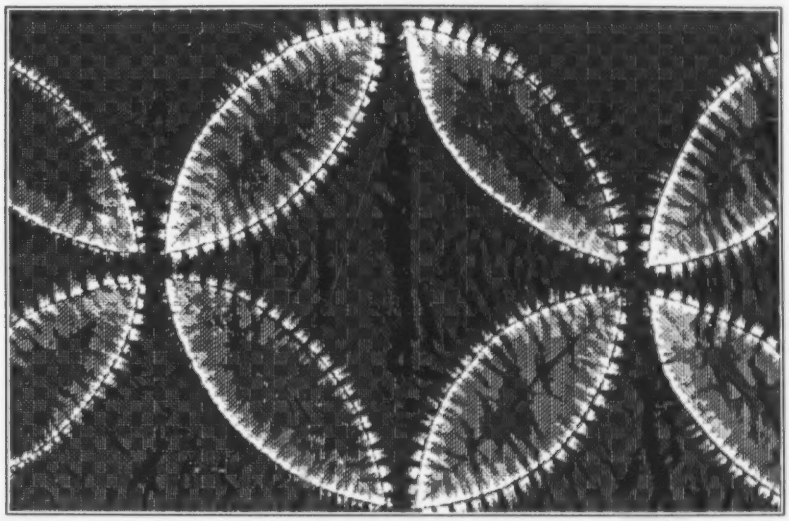

Figure 12. awase ori-nui, interlocking circles.

A variation that lies between the techniques of *ori-nui* shibori and the *awase ori-nui* shibori is created when two lines are drawn on the fabric. Only one of the lines is folded and brought up to and laid along the unfolded line. The stitching is run parallel and close to the fold line through all three layers of fabric (see Figure 13). The threads are then tightly drawn up and knotted (see Figure 14). The pattern created with this variation is seen in the right of Figure 8. The right edge of the stripe where the folded edge of the fabric lies, forms a distinctive and clear edge. The left edge is characterized by a thin line with blurred edged shapes on the outside edge of the line.

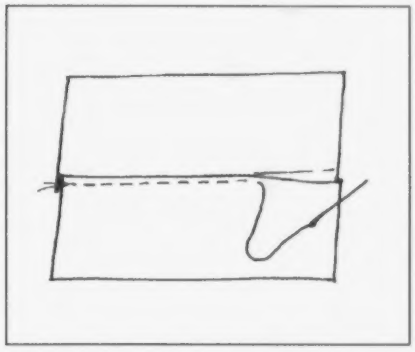

Figure 13. Ori-nui variation.

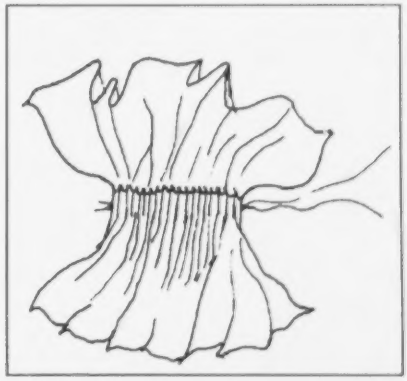

Figure 14. Ori-nui variation.

Karamatsu shibori, another variation which utilizes the running stitch, results in the motif known as the Japanese larch. In this variation, several concentric circles are stitched using parallel rows of running stitches (see Figure 15). Traditionally, the larch motif was accomplished by first folding the fabric in half and stitching in semicircles through both layers of fabric. For ease of managing the fabric in Design #6, the fabric was not folded but stitched instead in a complete circle, and then drawn up and knotted (see Figure 16). The finished effect of the circular motif is much like that found in *mokume* shibori (see Figure 17).

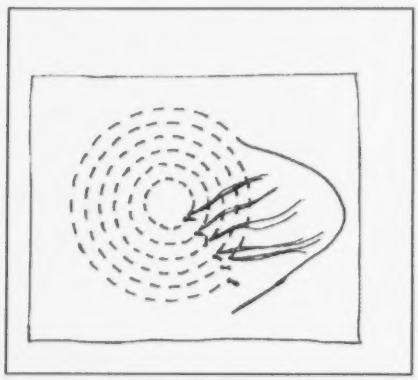

Figure 15. Karamatsu shibori.

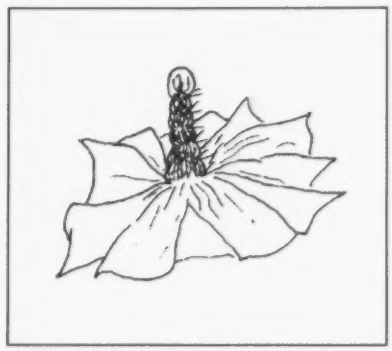

Figure 16. Karamatsu shibori.

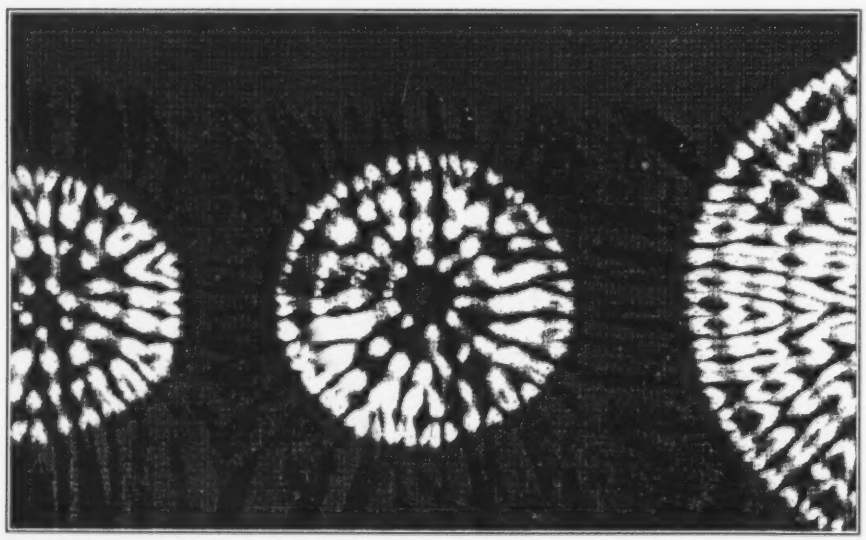

Figure 17. Karamatsu shibori showing Japanese larch pattern.

Theme

Another means by which a sense of unity within and among the textiles for this investigation was created was through the use of a common theme of interconnectedness. This theme was explored in both the composition of the overall designs and in the relationships of the motifs. In Designs #1, #2 and #4, interconnectedness was achieved by using images of plain weave structures as underlying grids for the compositions. In Designs #3, #5, and #6, interconnectedness was attained through the use of interlocking squares to form the underlying compositional structure for the designs. The interlocking circular motifs, comprised of petal-like shapes, are found in Designs #1, #2, #4, #5, and #6. The petals forming these circles lead the viewer's eye around the motif in design #1, and around and to each successive motif in Designs #2, #4, and #6. In design #5, the zigzag orientation of the petal shapes direct the eye of the viewer. In Design #6, another round motif is introduced. The circularity of this motif relates to both the wood grain effect used in the bands in Designs #3, #5, and #6, as well as echoing the circular shapes formed by the petal-like shapes in Designs #1, #2, #4, #5, and #6. The continuation of the design across each of the panels is another way of emphasizing the interconnectedness between and among the shibori pieces.

Dye and Fabric Selection

A sense of unity is also created by producing all the textiles on cotton fabric and by dyeing each of them deep shades of blue in a synthetic indigo vat. To ensure that each of the panels in a particular design was the same color, all the panels of an individual design were immersed into and taken out of the dye vat at the same time. By using indigo, I did not have to contend with color choices. However, the notion of relative value became a concern, and I aimed at a balance of light and dark, texture and non-texture in creating the textiles.

Format

A sense of unity between and among the large shibori textiles is further achieved by using common formats. Each completed design consists of double or triple panels. I was inspired by the traditional Japanese door curtains, *noren*, which are functionally designed and constructed in panels to facilitate ease of movement through the panels which hang over doorways. Although I was inspired by the panel format of the noren, my

designs were not developed with this function in mind but instead to be viewed as hangings.

Design #1

Design #1 (see Plate 1) is a diptych produced on 100% cotton sateen. Both panels were dipped four times in the synthetic indigo vat to achieve the depth of blue. Each panel measures 51 centimeters by 122 centimeters. With 7 centimeters separating each panel when hung, the overall dimensions are 109 centimeters by 122 centimeters.

The structure for this design was developed by using an enlarged plain weave grid. Each panel is a mirror image of the other which creates an image that is bilaterally symmetrical. The rectangular bands formed by the 'warp' and 'weft' are filled with evenly spaced parallel stripes resulting from the use of *ori-nui* shibori. Each of the open areas, created by the looseness of the plain weave structure, is filled with a single circular motif using *awase ori-nui* shibori. The circular motif was aligned so that the elliptical petals forming the circle are placed horizontally and vertically.

The overall feeling created in Design #1 is one of calm, peace and stability. This was achieved by using regular shapes and the patterns within those shapes, as well as by using the horizontal and vertical orientation of the shapes (Brainard, 1991). The orientation is evident in both the rectangular band shapes and in the orientation of the petal shapes that form the circular motifs. There are no large areas of negative space in this design and the highly patterned image creates a muted allover effect when viewed from a distance.

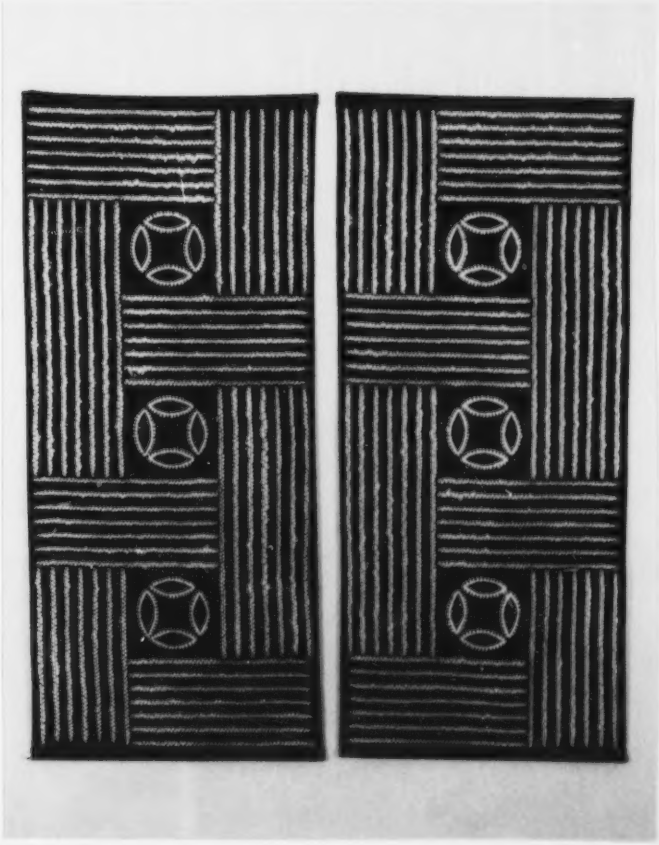

Plate 1. Design #1. 100% cotton sateen executed in ori-nui and awase ori-nui shibori and dyed in synthetic indigo. Each of the two panels measures 51 centimeters by 122 centimeters. With 7 centimeters separating each panel, the overall dimension is 109 centimeters by 122 centimeters.

Design #2

Design #2 (see Plate 2) is a triptych produced on 100% cotton sateen. The panels were dipped eight times to reach the depth of blue. Each of the three panels measures 75 centimeters by 122 centimeters. With 7 centimeters separating each panel, the overall dimensions are 239 centimeters by 122 centimeters.

Design #2 also utilizes an enlarged plain weave grid but the scale of each band is smaller than those in Design #1. This allows the regularity of the interwoven repeat to become more noticeable. Within the weave pattern, each 'warp' band and each 'weft' band are alternately patterned. One band is patterned with evenly spaced parallel rows of *ori-nui* shibori while the alternate band is patterned with an *awase ori-nui* border filled in with a pattern of interlinking circles also using *awase ori-nui* shibori. The interlocking circles emphasize the underlying theme of interconnectedness established by the designer and seen in Design #1.

The petal shapes that form the circular motifs are oriented diagonally and introduce a gentle sense of dynamism and movement. The petals forming these shapes are intentionally placed so that they appear to be overlapping where a band of the 'warp' or 'weft' patterning has crossed over it. This implies shallow three dimensional space as the bands appear to weave over and under each other. Slight tension is created between the orientation of the circular motifs and the stable regularity of the evenly spaced parallel stripes found in the alternate bands. The amount of negative space in this second design is more than that found in Design #1. The small squares of negative space that form as a result of the spaces in the weave structure, are perceived as being positive shapes and act to establish a slight tension.

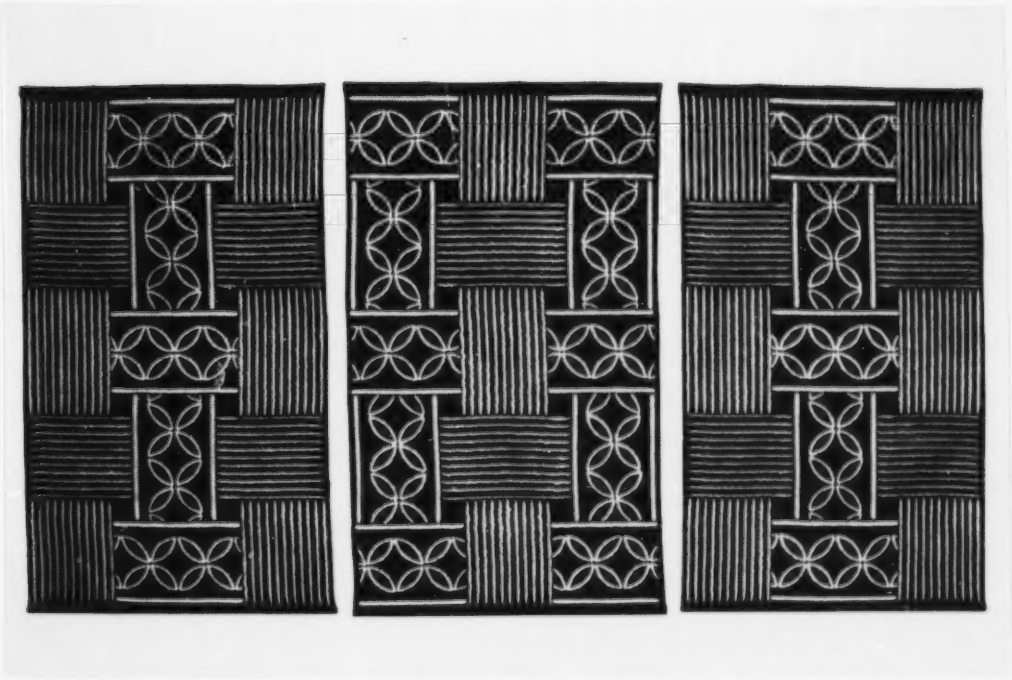

Plate 2. Design #2. 100% cotton sateen executed in ori-nui and awase ori-nui shibori and dyed in synthetic indigo. Each of the three panels measures 75 centimeters by 122 centimeters. With 7 centimeters separating each panel, the overall dimension is 239 centimeters by 122 centimeters.

Design #3

Design #3 (see Plate 3), which is a diptych, was produced on 100% Japanese kimono width cotton. The panels were dipped four times in the indigo vat to achieve the depth of blue. The width of each panel, the complete width of the fabric, is 36 centimeters and the length of each panel is 142 centimeters. With 2.5 centimeters between each panel, the overall dimensions are 75 centimeters by 142 centimeters.

In this design, the theme of interconnectedness is achieved through the use of interlinking square shapes which form the grid-like patterning of the two panels. As with warp and weft threads, the shapes appear to weave over and under each other. Also, like the interlocking circles, the squares form closed shapes. The design is balanced and because of the regular repeat of the squares, the manner in which the design would continue off the edges of the panels can be imagined.

Mokume shibori was used to create the textural patterning within the bands forming each square. I directed the stitching so that the wood grain effect would run approximately parallel to the perimeter of each square shape. This directs the viewer's attention in a subtle, unobtrusive manner around the square. Because the squares interlink, the viewer's eye is also lead throughout the design as the eye follows the path of the connected shapes. The diagonal lines that form at the corner junction of each square result from the need for enough space to draw up the stitching once it was completed. These lines have the added effect of creating another image within the larger overall image. Although the lines are not solid, the eye visually completes the lines to create the square diamond shape which is embedded within the interlocking squares. This causes the viewer's attention to flip back and forth between the two patterns. Once again, tension is created between the juxtaposition of the diagonal components and the stable horizontal and vertical components (Zelanski & Fisher, 1991). The square diamond shape mentioned above also helps to create tension and holds the viewer's attention.

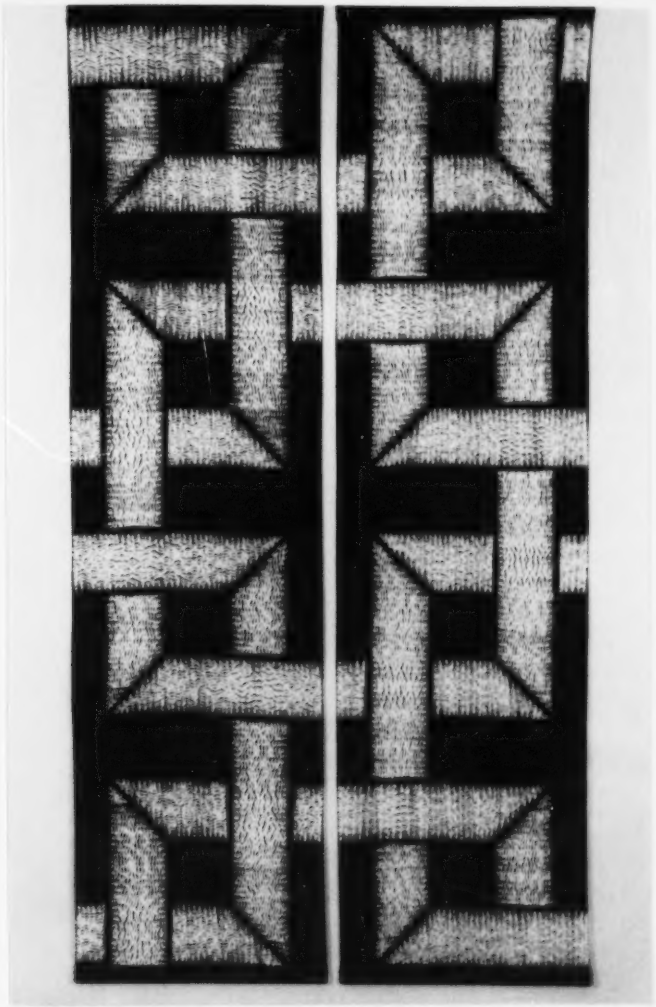

Plate 3. Design #3. 100% Japanese kimono width cotton, executed in mokume shibori and dyed in synthetic indigo. The width of each panel, the complete width of the fabric, is 36 centimeters and the length of each panel is 142 centimeters. With 2.5 centimeters between each panel, the overall dimensions are 75 centimeters by 142 centimeters.

Design #4

Design #4 (see Plate 4) is a triptych produced on 100% combed cotton poplin. The panels were dipped nine times in the indigo vat to achieve the depth of blue. Each of the three panels measures 91 centimeters by 147 centimeters. With a 7 centimeters separation between each panel when displayed, the overall dimensions are 280 centimeters by 147 centimeters.

In Design #4, the rigidity and regularity of the underlying weave grid structurally begins to disintegrate and become less predictable. Consequently, even though the viewer remains aware of the interwoven nature of the three panels, there is no longer a predictable pattern evident, as was the case in Designs #1 and #3. The effect of this change is to keep the viewer's attention moving throughout the design searching for a pattern of regularity that does not exist (Martinez & Block, 1985).

Disintegration of the image, creating a sense of 'holes' in the pattern, is another way in which the predictability of the designs has shifted. The stripes are parallel but the spacing between each of the stripes varies. The parallel stripes seem to disintegrate and no longer form continuous stripes throughout the panels. The stripes were created using *ori-nui* shibori, *awase ori-nui* shibori and the variation that lies between these two (see Figure 8). When seen from a distance, the viewer is aware of the differing widths of the stripes. When viewed at a close range, however, the viewer becomes aware of the unique patterning characteristics achieved with each stitching method. The dynamism that is evident in the striped bands is also evident in the break down of the interlocking circular motifs. The deliberately planned negative space that is created by the placement of the disintegrated images also helps to lead the viewer's attention through the panels. All these factors contribute to creating a sense of energy which keeps the eye moving within the overall design of these panels.

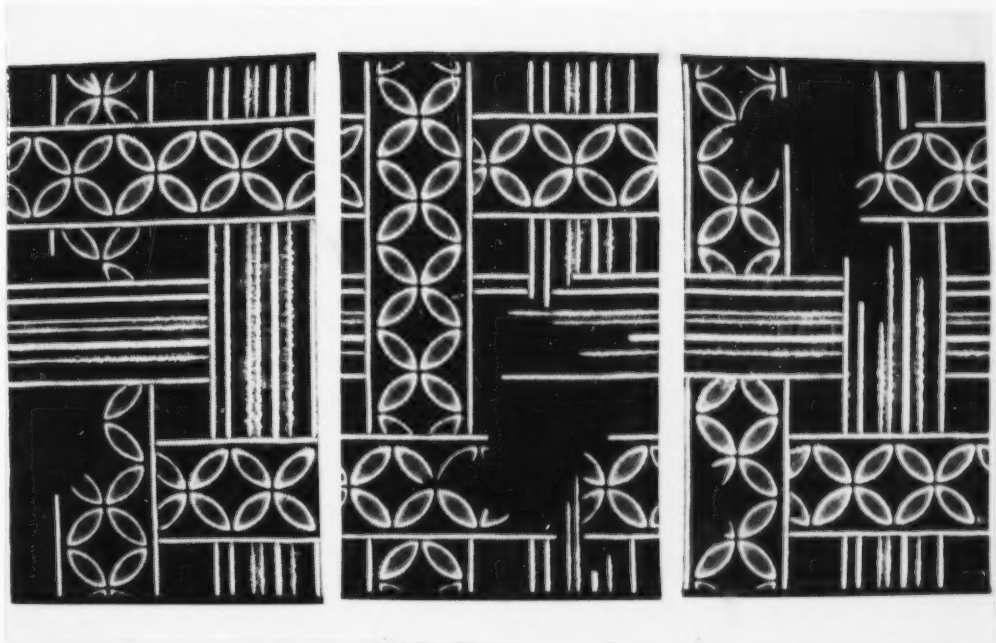

Plate 4. Design #4. 100% combed cotton poplin, executed in ori-nui, awase ori-nui and variation, and dyed in synthetic indigo. Each of the three panels measures 91 centimeters by 147 centimeters. With a 7 centimeter separation between each panel, the overall dimensions are 280 centimeters by 147 centimeters.

Design #5

Design #5 (see Plate 5) is a diptych which is produced on 100% combed cotton poplin. The panels were dipped in the indigo vat seven times to achieve the depth of blue. Each of the two panels measures 91 centimeters by 142 centimeters. With a separation of 7 centimeters between each panel, the overall dimensions are 189 centimeters by 142 centimeters.

Design #5 utilizes the same theme of interlocking shapes utilized in Design #3. In this case however, the focus is off centre and seen at a much closer range. Unlike Designs #1 through #4, where all of the stitching is contained within the positive shapes, this design utilizes *mokume* shibori in many of the negative shapes, setting up a figure and ground ambiguity. The small square negative spaces are bisected by diagonal lines which cut from corner to corner and are stitched using *mokume* shibori. The direction of these diagonal lines was randomly chosen so that there would be no predictable pattern created by these shapes. Directed by the diagonal lines, the viewer's attention is kept moving throughout the design in an attempt to find a pattern regularity which does not exist (Brainard, 1991; Martinez & Block, 1985).

The unstitched positive shapes in the design become apparent only when the viewer steps back from the panels. The same petal shapes that form the circle motifs in Designs #1, #2 and #4 have been used to form zigzag lines. These zigzag lines create a sense of energy and rhythm in the design (Brainard, 1991). The portions of the motifs that contain the zigzag of petal shapes were outlined using *awase ori-nui* shibori, the same technique used to create the petal shapes.

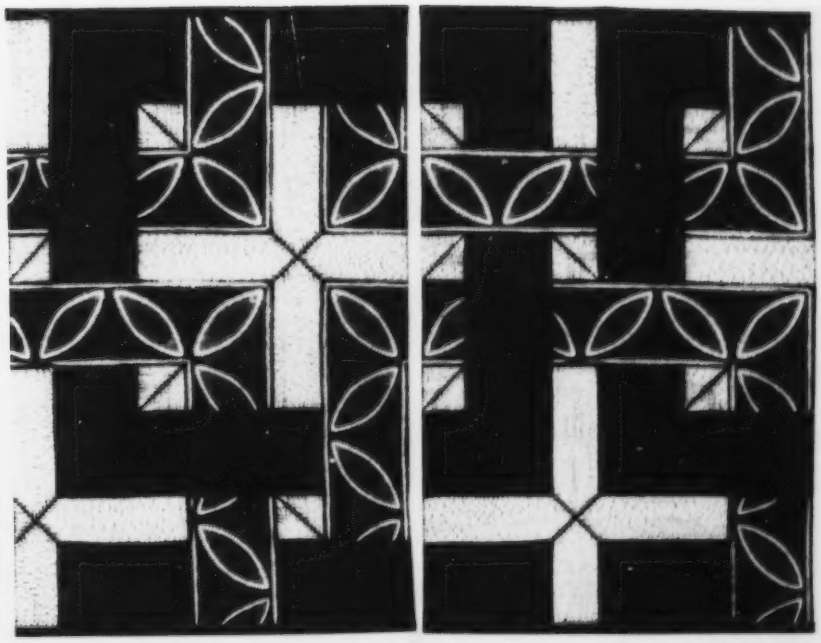

Plate 5. Design #5. 100% combed cotton poplin executed in mokume and awase ori-nui shibori and dyed in synthetic indigo. Each of the two panels measures 91 centimeters by 142 centimeters. With a separation of 7 centimeters between each panel, the overall dimensions are 189 centimeters by 142 centimeters.

Design #6

Design #6 (see Plate 6) is a triptych produced on 100% cotton sateen. The panels were dipped in the indigo vat eleven times to achieve the depth of blue. Each of the three panels measures 86 centimeters by 152 centimeters. With a 7 centimeter separation between each panel, the overall dimensions are 274 centimeters by 152 centimeters.

Design #6 uses the same type of interlocking square grid found in Designs #3 and #5, but the viewpoint is closer. Because of this close view point, the design is more abstract, and the viewer is unable to predict the nature the repetition of the interlocking shapes. Bands of *mokume* shibori frame the shapes that hold the interior motifs consisting of either the interlocking circle motif, parallel diagonal stripes, or the circular larch motif. The petal shapes that form the interlocking circular motifs are oriented so that some are placed diagonally and some placed horizontally and vertically. This variation in orientation creates a sense of movement and irregular rhythm.

The larch pattern, another circular motif, is introduced for the first time in this design, and is created using *Karamatsu* shibori. The circular shapes created by the interlocking circular motifs reemphasize the circular shape to add contrast and interest to the design. Repeating the circular shape creates lines of movement within and across the panels (Phillips & Bunce, 1993). The parallel stripes of *ori-nui* shibori and *awase ori-nui* shibori are placed diagonally to add contrast and interest to the design (Brainard, 1991; Zelanski & Fisher, 1988). The unpredictable variety in patterning and spacing of each line creates a sense of spontaneity. The diagonal orientation of these blocks echo the diagonals that are created at the corners of the wood grain bands and in the orientation of the petal shapes in the first and third panels of this design. This variation in orientation creates a more vibrant rhythm and tension as a result of the use of contrasts between the diagonal, and the horizontal and vertical elements.

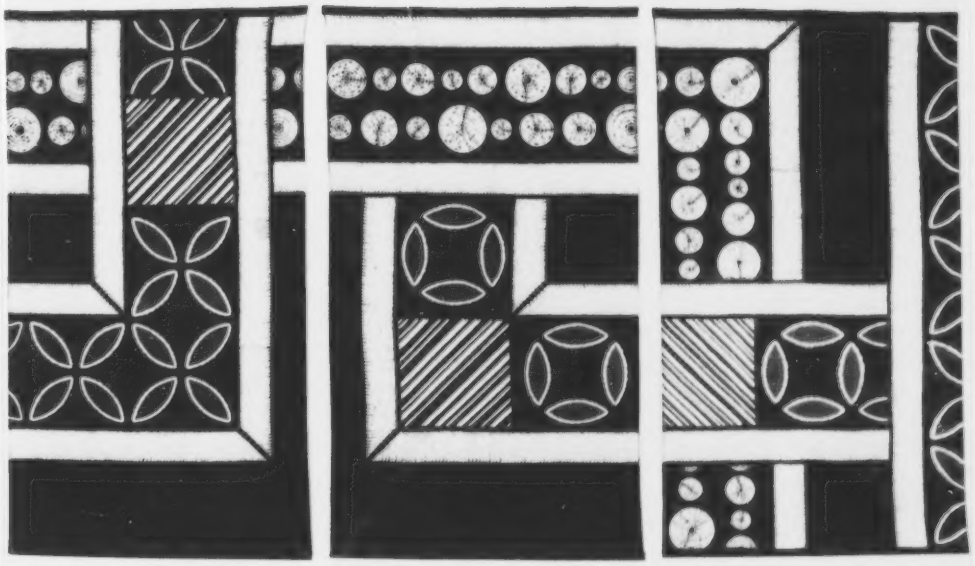

Plate 6. Design #6. 100% cotton sateen executed in ori-nui, awase ori-nui, karamatsu and mokume shibori, and dyed in synthetic indigo. Each of the three panels measures 86 centimeters by 152 centimeters. With a 7 centimeter separation between each panel, the overall dimensions are 274 centimeters by 152 centimeters.

Summary

As discussed in Chapter I, each designer creates forms by drawing from a bank of personal experience, knowledge and skills at a certain moment in time. It has been interesting for me to notice upon completion of the series the two distinct moods that were created in these textiles. The first three designs (see Plates 1 through 3) were designed when some aspects of my life were unresolved and unpredictable. Perhaps the design choices in Designs #1, #2, and #3 were guided by a subconscious attempt to achieve a sense of balance through order and control. The predictable rhythms, created by the regularity of the structure and patterning, create a sense of calm and order in these designs. In comparison, the last three textiles (see Plates 4 through 6) were created when my environment was once again more balanced and stable. Perhaps my personal experiences affected the subconscious design choices I made. The balance and stability in my life may have permitted the evolution of these designs as bolder, less predictable, open, dynamic and rhythmic. Another factor that may have contributed to the progression in the designs from calm and stable to bold and dynamic was my growing ease and expertise with the materials and techniques as I became more familiar with the shibori process.

CHAPTER V

Conclusion and Recommendations For Further Research

Conclusion

A means by which the quality of life can be improved for individuals and families is through living in surroundings that are aesthetically pleasing. Using well designed, handcrafted textiles is one way to achieve this end This investigation proposed that an examination of traditional Japanese shibori textiles could be utilized as a source of inspiration for the creation of contemporary shibori textiles. The specific objectives of this study were: to examine the traditional shibori textiles of Japan to determine the production methods used historically, to explore a variety of shibori techniques, and to design and produce a collection of handcrafted shibori textiles suitable for exhibition.

A literature review was undertaken which examined previous investigations which had utilized historical and cross-cultural studies as a source of inspiration for the creation of contemporary textiles. The review showed that a number of designers have examined the textiles of other cultures as sources of design inspiration.

Upon completion of the literature review, qualitative ethnohistorical research methods were used to gather data from secondary sources written in English. These sources included books, journals, unpublished theses and dissertations, and exhibition and museum catalogues relevant to the investigation. The data showed that Japanese shibori has a long and rich history with the 8th century examples found in the Shoso-in repository as the earliest extant examples. Binding and tying were probably the earliest shibori methods used. Elaborate stitching, wrapping and clamping techniques were developed later. Refined stitching techniques were used as early as the Kamakura period and became even more highly refined in the Muromachi period. The stitching techniques reached perfection in the tsujigahana textiles of the Momoyama period. During the Tokugawa period, with heavy traffic along the Tokaido highway and increased demand for shibori textiles, the cities of Arimatsu and Narumi became noted for production of shibori textiles. With the loss of regular traffic along the Tokaido highway during the Meiji period, the faster methods of *arashi* shibori, and *ita-jime* were developed in response to a declining market and the need to compete with shibori textiles available from other centers.

Having gained an understanding of the historical development of shibori, examples of both traditional and contemporary shibori were viewed as sources of inspiration. While in Japan, several exhibitions which displayed examples of shibori textiles, were viewed. Additional illustrative materials were also utilized. The visual review of both traditional and contemporary examples of shibori provided inspiration from historical designs, and a context within which the contemporary textiles were designed.

A synthesis of knowledge of the historical development of shibori and inspiration gained through viewing shibori examples lead to preliminary preparations in the process of designing the final textiles; a process which required several steps. A technical exploration was undertaken using subjectively chosen shibori techniques to prepare samples on a variety of cotton and silk fabrics, and results were noted in a journal. Prepared fabrics were dyed in a vat of synthetic indigo. This stage permitted the designer to become aware of limitations and possibilities of each technique.

The production of the final designs was guided by parameters established by the designer. Several methods were used to facilitate the design process. For each design, a small croquis traced onto watercolor paper was painted with gouache to approximate the anticipated shades of blue of the indigo dyed textiles. Each design was drawn full-scale onto paper and then traced from the paper onto fabric. Fabric was prepared using selected shibori techniques and dyed in a vat of synthetic indigo. When dyeing was completed, the textiles were rinsed, dried, and the stitching was removed. The fabric was again rinsed, and then washed and hung to dry.

Although there are many rich and elaborate examples of shibori to be found throughout the history of Japanese shibori textiles, it was the unpretentious and quiet beauty of the cotton and indigo textiles that most inspired me. The shibori technique is particularly suited to using both indigo and cotton because of the inherent properties of these two materials. By choosing to use the shibori tradition in conjunction with cotton and indigo, a collection of six shibori textiles suitable for exhibition was created. A sense of unity was achieved throughout the collection of textiles by: using a common theme of interconnectedness, using cotton for all the panels, using the running stitch as the technique to prepare all the fabrics, dyeing all of the textile panels a deep shade of blue in a synthetic indigo vat, and using a common format of two or three piece panels for each design.

All design proceeds from and is guided by the same principles and elements of design yet each designer responds in a unique manner not only objectively but subjectively and intuitively within established parameters. If another designer were to use the same broad parameters established for this creative project, the resulting designs would be different, for each designer brings his or her subjective and objective choices to the creative design process. The creative design process is a process which is continually evolving. Macleod's 1990 study suggests that "the creative process is always with us, whether in an active or passive state, and that a creative product is only final until a new creator provides fresh insight" (113-114), and in that sense, these six designs represent not only an ending but also a beginning. The textiles become a place for me to move forward from.

Recommendations For Further Research

As a result of this investigation, several questions arose that could provide areas for further research. Although it was not the intent of this project to methodically investigate the motifs traditionally used in Japanese shibori, this would be an interesting and valuable avenue for further research. An investigation of this sort would not only increase our knowledge and understanding of the symbolic meanings of some of the motifs used, but also might facilitate tracing specific influences during the periods of cultural contact in the history of Japan.

This investigation was concerned with the historical development of shibori in Japan from the Asuka through the Meiji periods. To understand how shibori has changed in the twentieth century, further investigations could consider the development of shibori since the end of the Meiji period until the present.

Since indigo has been used as a dye throughout many parts of the world for a number of centuries, there are numerous recipes for preparing an indigo vat. While I was trying to find indigo vat recipes that would work well, it became apparent that the indigo vat has a life of its own. Because of the inherent idiosyncrasies that occur when working with an indigo vat, a methodical comparison of the recipes and their dyeing potential could be a valuable project for further research.

This investigation utilized several aspects of traditional shibori, particularly fabric and dye choices, and stitching techniques. Further investigations could go beyond the traditional capabilities of shibori. For example, investigations could explore the utilization

of various non-traditional materials and dyes. Also, three dimensional sculptural possibilities of shibori could be explored by permitting some, or all, of the shibori techniques to remain in the completed work as an integral part of the structure of the finished textile.

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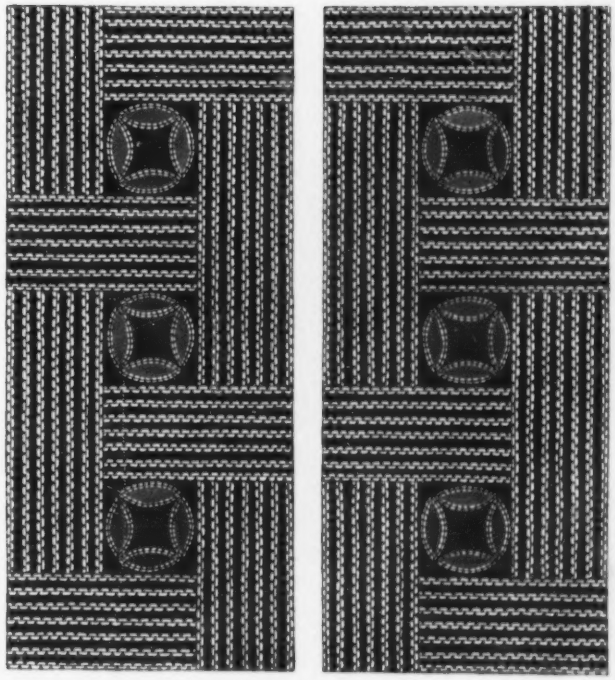
APPENDIX A
GOUACHE STUDIES

STUDY #1. Design #1



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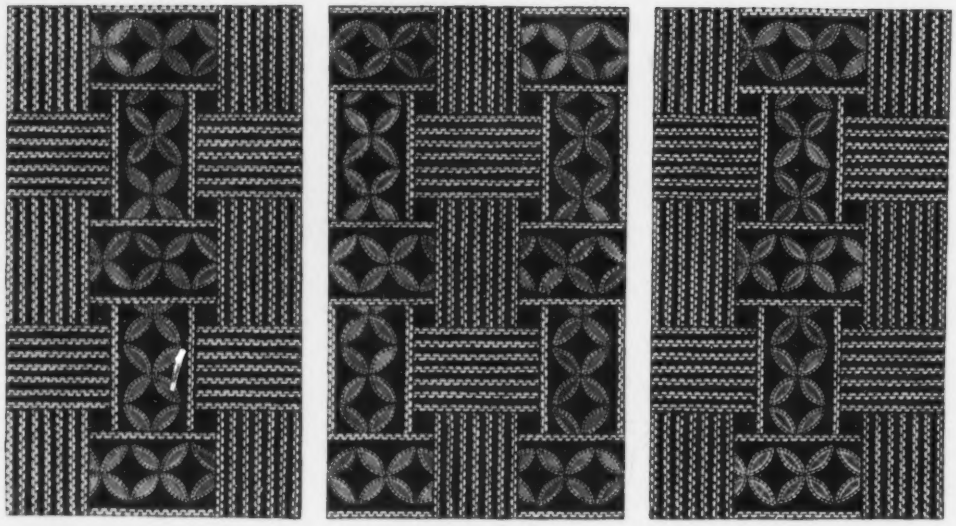

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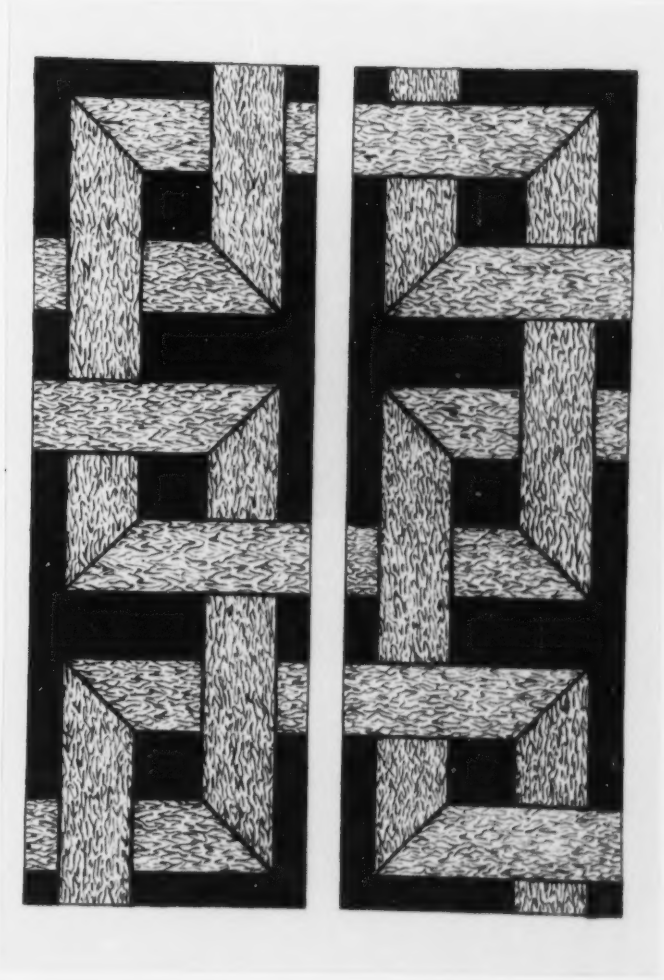

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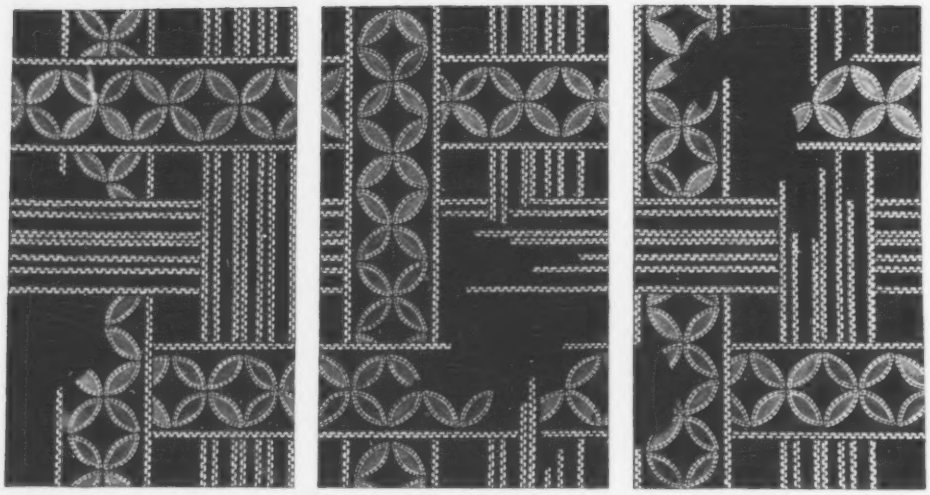

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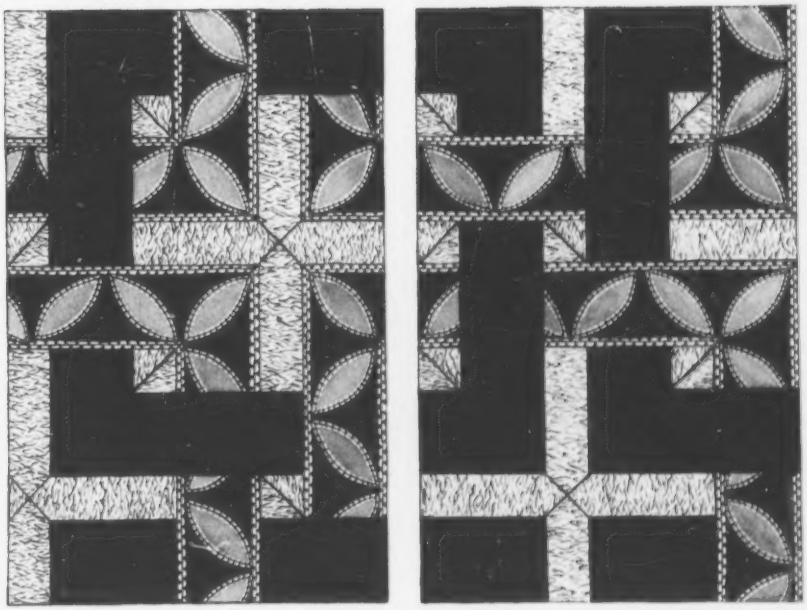

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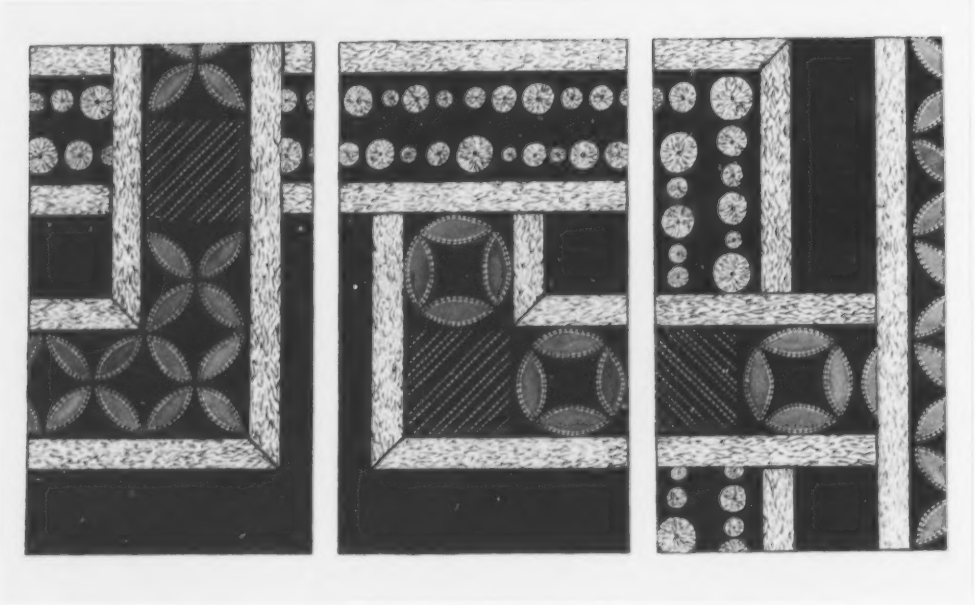

APPENDIX B

INDIGO VAT RECIPE

SUPPLIES
Indigo grains
Sodium Hydroxide (Lye)
Thiourea Dioxide (Thiox)
Non-iodized salt (e.g. pickling salt)
Metaphos

STOCK SOLUTION

Indigo grains	1 cup
Sodium Hydroxide (lye)	1 cup
Thiourea Dioxide (thiox)	2 TBSP

The indigo is mixed with enough water to make a lump free paste. In a separate container, add lye to 6 cups of water and set aside to cool (this solution should be luke warm before mixing with the indigo). In a third container, add thiox to 1 cup of warm water stirring gently to dissolve.

Slowly add the lye to the pasted indigo stirring gently to make as smooth a mixture as possible. Add the thiox solution slowly to avoid making air bubbles. Stir gently from time to time until the reduction is complete, that is, the Stock Solution turns yellow. If necessary, set the container of stock solution in a pan of HOT water. Raise the temperature to 135 F (no higher as it will kill the reaction), for 15 to 30 minutes or until reduction takes place.

DYE VAT

Warm water	20 gallons
Metaphos	3 TBSP
Salt	2 cups
Thiox	4 tsp.

Put the warm water into dye bath container. Stir in the Metaphos and salt. Add thiox (dissolved in warm water) and stir gently. Add reduced Stock Solution by carefully lowering the container into the dye vat and sliding the liquid out at an angle. Stir gently. After 30 to 60 minutes, the vat should be clear greenish-yellow with a shiny, dark blue metallic surface. The vat is then ready to use. If the vat is not clear and greenish-yellow in color, wait an additional 30 to 60 minutes. Sometimes it can take up to 6 hours for proper reduction.